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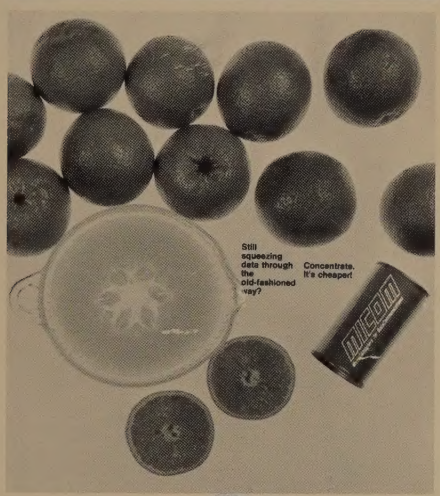

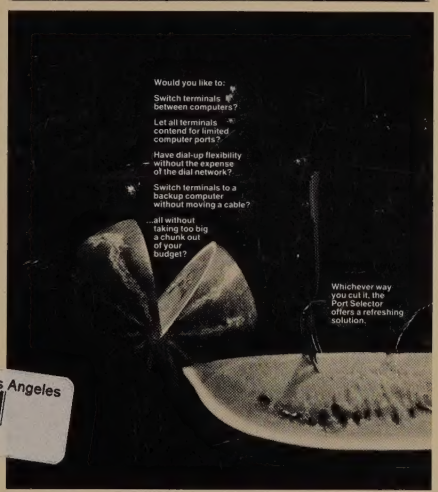
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THANK YOU FOR CHOOSING THE DIALNET3000 DATA MODEM

The MICOM DIALNET3000 Data Modem, a member of MICOM's family of intelligent data communications products, is designed to help you get the most efficient use of your data communications lines.

This User's Manual, in turn, is designed to quickly and effectively familiarize you with the functions and operation of the DIALNET3000 Models M3024+ and M3224+. The User's Manual is organized as follows:

Section 1, Product Description, introduces the M3024+ and M3224+ modems and describes the application of their operation.

Section 2, Do-It-Yourself Installation, contains a procedure for installing, configuring, and operating the modems.

Section 3, Operating Your Modem Locally, describes the procedures for originating and answering calls from your modem.

Section 4, Operating Your Modem from the DTE, describes how to configure, operate, and test your modem from the DTE keyboard.

Section 5, Testing Your Modem, describes the diagnostics available to you for detecting and isolating faults whenever your modem encounters data transmission problems.

Appendixes list the technical specifications for your modem.

WARRANTY

MICOM provides a warranty for the DIALNET3000 Data Modem as described on the Warranty page. Information about equipment repair by MICOM Customer Service is on the Customer Service page.

TRADEMARKS

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PUBLICATION CHANGE REQUEST

At the end of this manual, there is a postage-paid comment form for you to use if you think of an improvement to (or find a mistake in) this manual.

NOTICE

Specifications, tolerances, and design characteristics described in this manual are subject to change without notice.

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WARRANTY

MICOM warrants that the equipment delivered shall be free from defective material and workmanship for a period of 1 year from the date of delivery of equipment when given normal, proper and intended usage, and agrees to repair or replace, without cost, any part manufactured by MICOM provided that:

(a) MICOM is promptly notified upon discovery that the equipment is defective;

(b) The equipment is returned prepaid to the MICOM plant from which the equipment was shipped; and

(c) MICOM's examination of the equipment shall disclose that any defect was not caused by accident, misuse, neglect, alteration, improper installation, unauthorized repair or improper testing.

MICOM may, in its sole discretion, elect to repair or replace the equipment, in which event MICOM shall have a reasonable time to make repairs or to replace the equipment. MICOM will return the equipment freight prepaid.

THE PROVISIONS OF THIS WARRANTY ARE IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND MICOM'S LIABILITY ARISING OUT OF THE MANUFACTURE, SALE, OR SUPPLYING OF THE EQUIPMENT OR ITS USE, WHETHER BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, PRODUCTS LIABILITY OR OTHERWISE, SHALL NOT EXCEED THE ORIGINAL COST TO THE BUYER OF THE EQUIPMENT. IN NO EVENT SHALL MICOM BE LIABLE TO THE BUYER OR ANY OTHER PERSON OR ENTITY FOR UNINTENDED OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR USE DAMAGES) ARISING OUT OF THE MANUFACTURE, SALE OR SUPPLYING OF THE EQUIPMENT.

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Before returning any equipment, however, please call MICOM Customer Service. Telephone numbers of our Regional Offices are listed on the back cover of this manual.

A Customer Service engineer will answer warranty-related questions, discuss your specific equipment problems, and — when necessary — give you shipping instructions for returning equipment to MICOM for repair. To return a product for service or repair, you *must* obtain a Return Authorization number from MICOM Customer Service.

Shipping charges must be prepaid.

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SECTION 1
PRODUCT DESCRIPTION

1.1 INTRODUCING THE M3024+ AND M3224+

The M3024+ standalone unit and M3224+ card module are asynchronous and synchronous, 1200 and 2400 bps, full-duplex, direct-connect modems. These modems operate over the Direct Distance Dialing (DDD) telephone network or 2-wire leased lines and conform to CCITT recommendation V.22 bis at 2400 bps. At 1200 bps, the modems are compatible with Bell 212 modems.

The main features of the modems are:

- Full auto-dial and auto-logon operation (including nonvolatile storage capacity for up to 20 telephone numbers and logon sequences)
- Automatic adaptive equalizer
- 2-wire, full-duplex operation at 2400 or 1200 bps
- Asynchronous and synchronous operation
- Direct connection to the dial network
- Programmable, fixed loss loop, or permissive connection
- Manual or auto-answer
- Manual or auto-originate
- Automatic speed detection
- Allows for voice communication
- Front-panel status and diagnostic indicators
- Operator-selected test modes
- Compact in size

Like MICOM's other products, these modems are designed for do-it-yourself installation. No special tools are required. They have a built-in self-test feature and built-in diagnostic modes for easy verification of their performance.

The M3024+ is housed in a standalone enclosure for tabletop use. The M3224+ card module is designed for mounting in the M3200 rack-mount chassis.

1.2 YOUR MODEM'S APPLICATIONS

The M3024+ and M3224+ modems convert a 2400 or 1200 bps digital data signal from data terminal equipment (DTE) (terminals, computer, etc.) into a form suitable for transmission over the DDD network. Since your modem is a two-way device, it also converts telephone data signals at 2400 or 1200 bps into digital data format for reception by the DTE.

Figure 1-1 shows typical data networks using various modems. The direct connect access to the dial network permits you to transmit data to or receive data from almost any location equipped with another M3024+ or M3224+, a V.22 bis-compatible or Bell 212 modem, or a V.22 bis- or 212-compatible modem from another manufacturer.

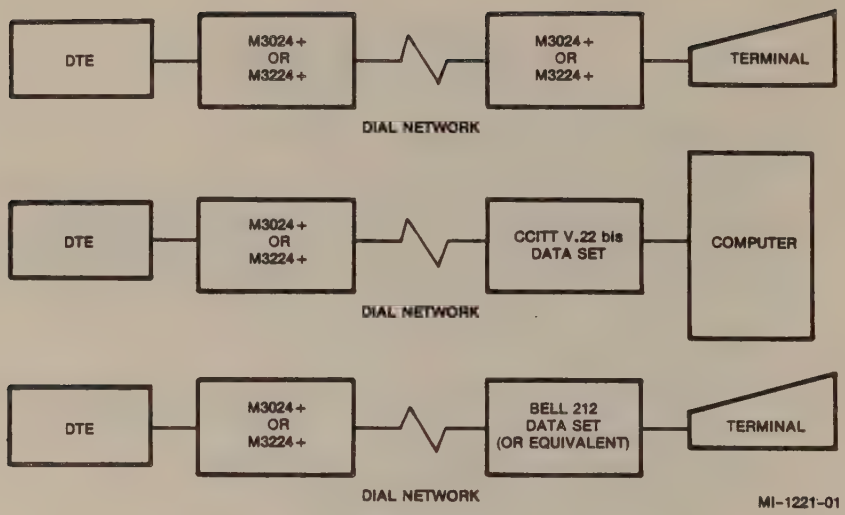


Figure 1-1. M3024+ and M3224+ Applications

The auto-answer feature allows your modem to answer incoming calls and receive data unattended. Or, if you want to use your phone line for voice communications as well, you can plug a telephone handset into your modem, set the modem up for manual answer, and switch between voice and data transmission using a pushbutton in the front panel.

The auto-dial feature allows you to communicate with your modem from the connecting terminal keyboard to store up to 20 telephone numbers in a nonvolatile directory, and to control the operation of the modem in both normal and test modes. You can make data calls directly from your terminal with a minimum of keystrokes and without having to use a telephone. The full autodial features are described in section 4.

1.3 REQUIREMENTS FOR OPERATION WITH THE TELEPHONE COMPANY

1.3.1 Notifying the Telephone Company

CAUTION: In accordance with FCC requirements, the modem must NOT be connected to pay telephones or party lines.

Whenever the modem is connected to *or* disconnected from a telephone company line, *you, the user, are required* to notify the telephone company.

You must supply the following information:

- Whether the notification is about a connection or disconnection
- Manufacturer of the device: MICOM Systems, Inc.
- Model number of the device: M3024+, M3224+
- FCC Registration Number: BEB9E9-70752-DM-N
- Ringer Equivalence: 1.0B
- Jack(s) which may be used: USOC RJ11C, RJ41S, RJ45S

MICOM has obtained FCC approval to attach the modem to the telephone company system. The FCC Part 68 label must remain attached to your modem.

1.3.2 Repairing Faulty Modems

WARNING: Do NOT attempt to repair the modem. Attempts to repair the modem may cause injury and may also damage the equipment on the telephone network. Attempts to repair the modem are VIOLATIONS of FCC rules.

1.3.3 Telephone Company Rights and Responsibilities

Under certain circumstances, the telephone company may discontinue service if the device causes harm to the telephone network. In this case, the telephone company shall:

- Promptly notify the customer of the discontinuance.
- Afford the customer the opportunity to correct the situation which caused discontinuance.
- Inform the customer of his rights to bring a complaint to the FCC concerning the discontinuance.

The telephone company may make changes in its facilities and services which may affect the operation of the user's equipment. However, the user shall be given adequate notice, in writing, to allow the customer to maintain uninterrupted service.

1.4 DIRECT CONNECT REQUIREMENTS

The M3024+ and M3224+ modems are FCC-registered devices which directly connect to the DDD networks in North America. In addition to all the safety requirements set by FCC Part 68, there are various connection arrangements provided by the telephone company to ensure that the signal level received at the telephone company central office does not exceed −12 dBm.

Standard data jack arrangements are provided by the telephone company and are identified by a Universal Service Order Code (USOC). The USOC information must be specified when ordering standard data jack arrangements from the telephone company. These jacks allow the connecting and disconnecting of the modem to and from a DDD network without interfering with the operation of other equipment connected to the network.

The telephone company provides the following connection arrangements:

- Fixed Loss Loop Arrangement (FLL) — USOC RJ41S data jack
- Programmed Arrangement (PROG) — USOC RJ41S or RJ45S data jack
- Permissive Arrangement (PER) — USOC RJ11C modular jack

1.4.1 Fixed Loss Loop Arrangement

The Fixed Loss Loop arrangement is provided by the RJ41S universal data jack set to the FLL mode. When this arrangement is used, the output level is set to −4 dBm maximum. The subscriber loop is set by the telephone company to 8 dB of attenuation by a pad located within the telephone company-provided jack. The amount of attenuation required in the pad is based on loop loss measurements performed by the telephone company at the time the data jack is installed.

1.4.2 Programmed Arrangement

The Programmed arrangement is provided by an RJ45S data jack or RJ41S universal data jack set to the PROG mode. When this arrangement is used, the output signal level from the modem is set within the range of 0 to −12 dBm by a level-setting resistor in the data jack. The value selected for the resistor is based on loop loss measurements performed by the telephone company. The modem's output signal level is set automatically when it is plugged into the data jack. To obtain optimum performance from the modem, it is recommended that the Programmed arrangement be used.

The required values of the programming resistor for modem output levels in 1 dB steps are listed below:

Programming Resistor Value (ohms ±1%)	Modem Output Signal Level (dBm ±1 dB)
0	0
150	−1
336	−2
569	−3
866	−4
1240	−5
1780	−6
2520	−7
3610	−8
5490	−9
9200	−10
19800	−11
OPEN	−12

NOTE: The RJ41S universal data jack is installed by the telephone company with both the resistor and pad for the PROG and FLL arrangements. A switch on the data jack allows the user to select between these two connection arrangements.

1.4.3 Permissive Arrangement

The Permissive arrangement is provided by the RJ11C jack, the standard modular jack installed by the telephone company on most voice lines. When the Permissive arrangement is used, the output level of the modem must be fixed at −9 dBm maximum.

SECTION 2
DO-IT-YOURSELF INSTALLATION

2.1 INSTALLATION OVERVIEW

This overview presents the required steps for Do-It-Yourself Installation. References in each step direct you to a detailed description for the function in that step. Two versions of the installation procedure are described, one for the standalone unit (M3024+) and one for the card module (M3224+).

In addition, a checklist is provided to aid you in selecting the switch settings for your system parameters (see table 2-1).

NOTE: If you intend to operate from the DTE keyboard, refer to section 4 for configuration instructions.

2.1.1 Standalone Unit Installation

1. Select a location for your modem (refer to paragraph 2.2).
2. Pull down the modem's hinged front panel and remove top cover to access the test and operation switches (refer to paragraph 2.3).
3. Set switches to select the desired parameters (refer to paragraphs 2.3 and 2.4).
4. Close the front panel and replace top cover.
5. Cable your modem to the required interfaces (refer to paragraph 2.6).
6. Connect the power cable to the modem, plug the transformer into an outlet, and monitor the status indicators (refer to paragraph 2.7).

2.1.2 Card Module Installation

1. The M3224+ card module is to be mounted in an M3200 rack-mount chassis. Refer to the M3200 Rack-Mount Chassis User's Manual, stock number 800-1222, for chassis installation instructions.
2. Open the front panel of the rack-mount chassis (refer to paragraph 2.3).
3. Set switches to select the desired test and modem operation parameters (refer to paragraphs 2.3 and 2.4).
4. Insert card module.
5. Cable your modem to the required interfaces (refer to paragraph 2.6).
6. Apply power and monitor the status indicators (refer to paragraph 2.7).
7. Close the front panel.

Table 2-1. System Parameter Checklist

1. In what mode will your modem normally be used?

   ☐ Originate ☐ Answer (See table 2-3.)

2. Will you be linking with a 2400 bps modem or a Bell 212 type modem, or both? What are their disconnect requirements? (See table 2-2.)

   ☐ 2400 bps modem Disconnect Requirements

   _____

   _____

   _____

   ☐ Bell 212 type modem Disconnect Requirements

   _____

   _____

   _____

3. Will you be using a private, leased line or the Direct Distance Dialing (DDD)? (See table 2-4.)

   ☐ Private, leased line ☐ DDD

4. If you are connecting to the DDD, what connection arrangement will you use? (See table 2-4.)

   ☐ PER (Permissive) ☐ PROG (Programmed) ☐ FLL (Fixed Loss Loop)

5. What are the interface requirements of the connecting DTE? (See tables 2-3 and 2-4.)

   Operation Mode: ☐ Synchronous ☐ Asynchronous

   Clock Source: ☐ External Transmit Clock ☐ Slaved to Receiver

   ☐ Internal

   Character Length:

   ☐ 8 bits ☐ 9 bits ☐ 10 bits ☐ 11 bits

6. Will you use the telephone line for voice communications?

   ☐ Yes (Refer to paragraph 3.1.)

   ☐ No

2.2 SELECTING A LOCATION FOR YOUR MODEM

Your modem is designed and packaged for tabletop placement or rack-mount installation. Your modem should be located within 11 feet of the telephone jack, within 6 feet of a grounded 115 V ac power outlet, and no further than 50 feet from the connecting DTE.

The location should be relatively dust-free and free from temperature extremes and excessive humidity.

CAUTION: Do not stack equipment, other than a telephone, on top of your modem. Excessive weight may bend the cover and possibly damage the components inside.

Provide sufficient space for cover removal, switch handling, and unobstructed air flow around your modem. The standalone unit and rack-mount chassis dimensions are shown in figure 2-1.

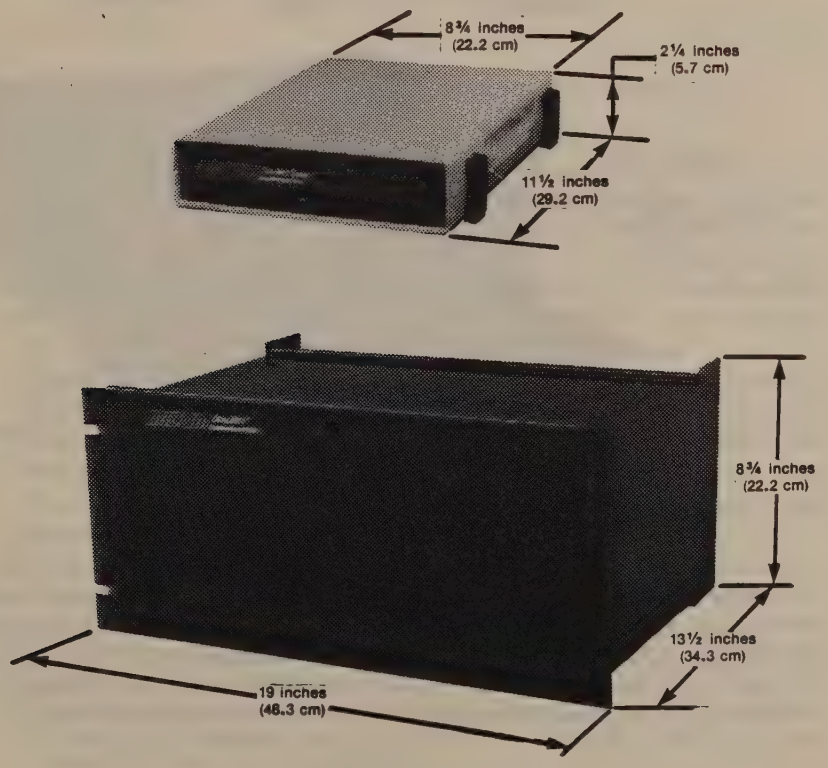


Figure 2-1. Dimensions

2.3 SETTING YOUR MODEM'S SWITCHES

Your modem contains four switch groups which permit you to select a variety of operating and test modes. Two switch groups are located on the front of the modem (behind the front panel) and are easily accessed by opening the front panel on either the standalone unit or the rack-mount chassis (see figure 2-2).

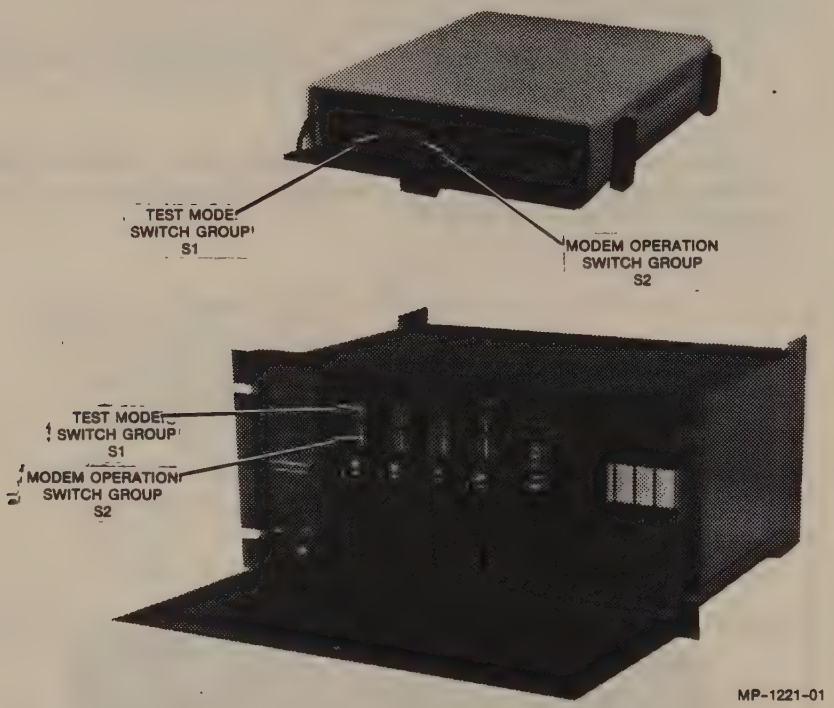


Figure 2-2. Locations of Modem Operation and Test Mode Switches

The remaining two switch groups are located near the rear of the card module and you must remove the cover of the standalone unit to access them. Unfasten the four latches on its sides, pull the bottom of the latches away from the modem, and lift off the cover. The card module must be removed from the rack-mount chassis. See figure 2-3 for the locations of these two switch groups.

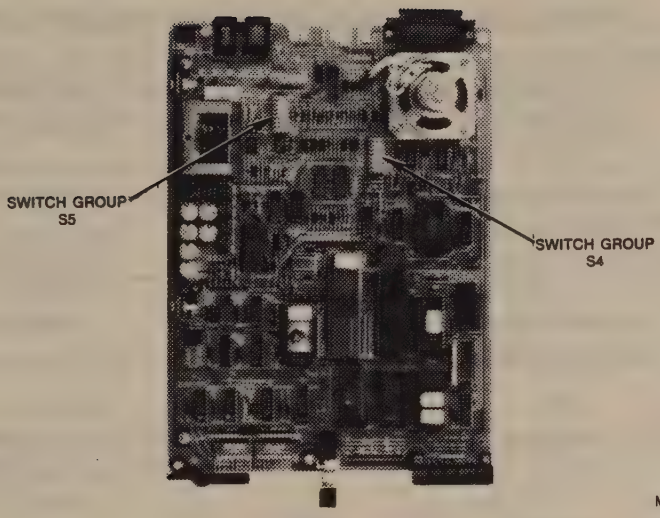


Figure 2-3. Locations of System Operation Switches

Each switch group has eight positions and each position is labelled for its function. For example, position 1 of switch group S1 is labelled AL for local analog loopback. Each switch position has two settings, ON and OFF. The ON setting is down or closed; the OFF setting is up or open. You can move the switch with the tip of a ballpoint pen. A shorthand notation, switch group-switch position, is used here to refer to the switches. For example, S1-1 refers to switch group S1, switch position 1.

The switch functions are organized by switch group, that is, modem operating functions are set by S2, test mode functions are set by S1, and system operating functions are set by S4 and S5. See tables 2-2 through 2-4 for details of the selections.

Switches S2-3 and S2-4 should be set to match the data word length of the connecting DTE. Typically, all three disconnect features are enabled, that is, S2-6 though S2-8 are set OFF. In synchronous mode (S4-1 ON), the transmit clock source (S1-7 and S1-8) is selected to match the requirements of the connecting DTE. In asynchronous mode (S4-1 OFF), set the transmit clock source to internal. Also, in asynchronous mode, use normal range (S4-2 OFF) unless the connecting DTE requires the additional range. The settings of S4-5 through S4-8 depend on the interface configuration of the connecting DTE. Switches S5-1 through S5-7 are set to the Telco line direct connection arrangement or to "other" for private line applications.

Table 2-2. Switch Group S2 Modem Operation Switch Settings

NOTE: Configuration switch groups on your unit may have different designators to indicate the on and off settings. In this manual, ON and OFF are used to designate the following equivalent terms: ON = down or closed; OFF = up or open.

The normal setting for the S2 switch group is OFF. If operating from the DTE keyboard, all S2 switches must be OFF.

Function	Switch Position and Setting		Meaning
LS	**S2-1**		
Low Speed	OFF		2400 bps operation
	ON		1200 bps operation
	S2-2		
Reserved for Future Use	OFF		No effect
	ON		No effect
8/9/10/11	**S2-3**	**S2-4**	
Character Length (includes start and stop bits)	ON	OFF	8 bits
	ON	ON	9 bits
	OFF	OFF	10 bits
	OFF	ON	11 bits
DSRO	**S2-5**		
Data Set Ready Off	OFF		DSR forced on during test modes
	ON		DSR forced off during test modes
SSDD	**S2-6**		
Send (Long) Space Disconnect	OFF		Send 4-second space before disconnect when DTR drops
Disable	ON		No 4-second space before disconnect

Table 2-2. Switch Group S2 Modem Operation Switch Settings (continued)

Function	Switch Position and Setting	Meaning
LSDD	**S2-7**	
Long Space Disconnect Disable	OFF	Disconnect on 1.6 seconds of receive spacing
	ON	No disconnect on receive spacing
CLDD	**S2-8**	
Carrier Loss Disconnect Disable	OFF	Disconnect on 433 ms loss of receive carrier
	ON	No disconnect on loss of receive carrier

Table 2-3. Switch Group S1 Test Mode Switch Settings

NOTE: Configuration switch groups on your unit may have different designators to indicate the on and off settings. In this manual, ON and OFF are used to designate the following equivalent terms: ON = down or closed, OFF = up or open.

The normal setting for the S1 switch group is OFF. If operating from the DTE keyboard, all S1 switches must be OFF.

Function	Switch Position and Setting		Meaning
AL	**S1-1**		
Analog Loopback	OFF		Normal modem operation
	ON		Local Analog Loopback mode
TP	**S1-2**		
Test Pattern	OFF		Normal modem operation
	ON		Test Pattern enabled
RDL	**S1-3**		
Remote Digital Loopback	OFF		Normal modem operation
	ON		Remote Digital Loopback mode
DL	**S1-4**		
Digital Loopback	OFF		Normal modem operation
	ON		Local Digital Loopback mode
	S1-5		
Reserved for Future Use	OFF		No effect
	ON		No effect
ANS	**S1-6**		
Answer or Originate Mode	OFF		Originate mode
	ON		Answer mode
ETC/RXC	**S1-7**	**S1-8**	
Transmit Clock Source (synchronous operation only)	OFF	OFF	Internal
	ON	OFF	External
	X*	ON	Slaved to Receiver

*X = setting doesn't matter

Table 2-4. Switch Groups S4 and S5 System Operation Switch Settings

NOTE: Configuration switch groups on your unit may have different designators to indicate the on and off settings. In this manual, ON and OFF are used to designate the following equivalent terms: ON = down or closed, OFF = up or open.

The normal setting for the S4 and S5 switch groups is OFF. If operating from the DTE keyboard, set S4-1 through S4-3 and S4-8 to OFF. Set all other switches to required parameter.

Function	Switch Position and Setting	Meaning
ASY/SYN	**S4-1**	
Asynchronous or Synchronous Mode	OFF	Asynchronous mode
	ON	Synchronous mode
NOR/ETD	**S4-2**	
Normal or Extended Asynchronous Range	OFF	Normal asynchronous range (2400 or 1200 bps ±1%)
	ON	Extended asynchronous range (2400 or 1200 bps ±2.3%)
NGT/GT	**S4-3**	
Guard Tone	OFF	No Guard Tone transmitted
	ON	1800 Hz Guard Tone transmitted with high channel
DIA/DED	**S4-4**	
Direct Connect or Leased Line	OFF	Direct connect to DDD
	ON	Leased line connection
12	**S4-5**	
Speed Mode Indicator	OFF	EIA pin 12 not connected
	ON	SMI to DTE on EIA pin 12
18	**S4-6**	
Analog Loopback Command	OFF	Ignore command on EIA pin 18
	ON	Accept Analog Loopback command from DTE on EIA pin 18

Table 2-4. Switch Groups S4 and S5 System Operation Switch Settings (continued)

Function	Switch Position and Setting				Meaning
23	**S4-7**				
Data Rate Select	OFF				Ignore command on EIA pin 23.
	ON				Speed follows EIA pin 23 if LS switch (S2-1) is OFF.
25	**S4-8**				
Analog Loop-back Command	OFF				Ignore command on EIA pin 25.
	ON				Accept analog loopback command from DTE on EIA pin 25.
PE/PR	**S5-1**	**S5-2**	**S5-3**	**S5-4**	
Connection Arrangement	ON	ON	ON	OFF	Permissive arrangement
	OFF	ON	ON	ON	Programmed arrangment
	OFF	OFF	OFF	OFF	Other
FL	**S5-5**	**S5-6**	**S5-7**		
Fixed Loss Loop Arrange-ment	ON	ON	ON		Fixed Loss Loop arrangement
	OFF	OFF	OFF		Other
	S5-8				
Reserved for Future Use	OFF				No effect
	ON				No effect

2.4 DATA OR VOICE MODE SELECTION

The Data Mode (DM) switch on the front of your modem allows you to switch between voice and data operation. The switch is a two-position locking switch. That is, when you push it, it locks in (data position); a second push releases it to the out position (voice position). When the modem is operating properly and the switch is in the data position, the Modem Ready (**MR**) indicator is ON. When you release the switch to the out or voice position, the **MR** indicator is OFF.

If you have a telephone set connected to the modular jack (J3) on your modem, you can use it for normal voice operation by releasing the DM switch to its out or voice position. When the DM switch is in the data mode position and the modem is transmitting or receiving data, you can lift the telephone handset and hear the data on the line (which may induce errors) but you cannot dial or use the telephone transmitter. For detailed operating instructions, refer to paragraphs 3.1 and 3.2.

2.5 YOUR MODEM'S STATUS INDICATORS

As shown in figure 2-4, there are four status indicators on the right side of your modem. The indicators are LEDs (light-emitting diodes) mounted on the circuit board and, when ON, are visible through the front panel. A clear plastic insert, mounted behind the front panel, contains the labels for the indicators. The indicator functions are described in table 2-5.

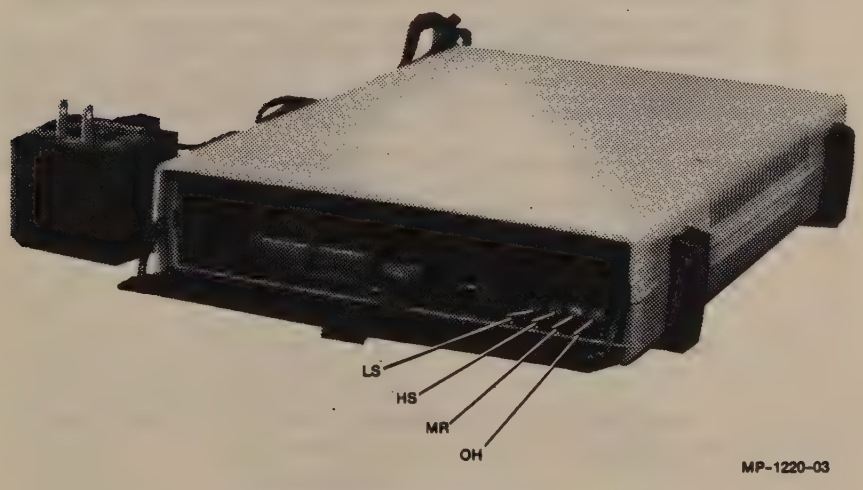


Figure 2-4. Modem Status Indicators

Table 2-5. Status Indicators

Indicators	ON	OFF	FLASHING
LS Low Speed	Modem is in 1200 bps operation.	Modem is in 2400 bps operation.	Modem is in a test mode or RDL is detected.
HS High Speed	Modem is in 2400 bps operation.	Modem is in 1200 bps operation.	Modem is in a test mode or RDL is detected.
MR Modem Ready	Modem is in data mode and has passed the self-test.	Modem has AL and TP or RDL and TP enabled or is in voice mode.*	Modem failed self-test at power up or is in the TP test mode and is receiving errors.
OH Off-Hook	Modem is off-hook.	Modem is on-hook.	Doesn't FLASH.

*When the modem powers up in the voice mode (DM switch released), the **MR** indicator turns ON for 3 seconds to indicate successful self-test, then goes OFF to indicate modem is in voice mode.
The **MR** indicator also serves as a Carrier Detect indicator. When the modem goes off-hook to initiate a data call, the **MR** goes OFF. When the correct handshake has been performed and carrier is detected, the **MR** goes ON.

2.6 CONNECTING YOUR MODEM

Before connecting your modem to the telephone line, you must determine which one of the three connection arrangements you will use — Permissive, Fixed Loss Loop, or Programmed.

The Programmed connection provides the best transmission performance of the three arrangements. Your telephone line must be terminated in either an RJ45S programmed jack or an RJ41S universal jack switched to the PROG mode.

For Fixed Loss Loop operation, your telephone line must be terminated in an RJ41S universal jack and the jack must be switched to the FLL mode.

The Permissive connection arrangement allows you to connect your modem to an RJ11C jack, the most common telephone line arrangement. The RJ11C jack is the standard modular jack used to connect voice lines.

Your modem is provided with a 14-foot cable. The cable has an 4-pin plug on one end and a 4-pin plug on the other. Table 2-6 summarizes the jack and cable requirements.

You must use an 8-conductor cable for Programmed and Fixed Loss Loop connections. This cable may be obtained from MICOM, or an alternate supplier. Use the 4-conductor cable provided with the modem for Permissive connections.

NOTE: Don't forget that switch group S5 must be set to match the connection arrangement you wish to use.

Table 2-6. Telephone Line Connection Requirements

Type of Connection	Telephone Line Termination Jack (USOC Number)	Cable Required (MICOM Part Number)
Programmed	RJ45S Programmed Jack	8-conductor (345-1025-014)
	RJ41S Universal Jack (switched to the PROG mode)	8-conductor (345-1025-014)
Fixed Loss Loop	RJ41S Universal Jack (switched to the FLL mode)	8-conductor (345-1025-014)
Permissive	RJ11C Modular Jack (standard for termination of voice lines)	4-conductor (650-1099-014) Included with modem

Connecting cables to your modem is simple. The standalone unit has four connectors and the card module has three (see figure 2-5). The large 25-pin connector (J7) is for the RS-232-C cable to the DTE.

The two modular telephone jacks (J3 and J4) on the standalone unit are for the telephone line and telephone set. Use the 8-pin RJ45S connector for the telephone line and the 6-pin RJ11C connector for the telephone set.

The rack-mount chassis has a single modular jack for each card slot. The jack will accept an 8-pin or 6-pin connector.

The small round connector (J2) on the standalone unit is for the power cable which supplies power from a plug-in wall transformer. Do not apply power at this time (refer to paragraph 2.7).

The rack-mount chassis has a power supply module which supplies power to all the card modules in the chassis.

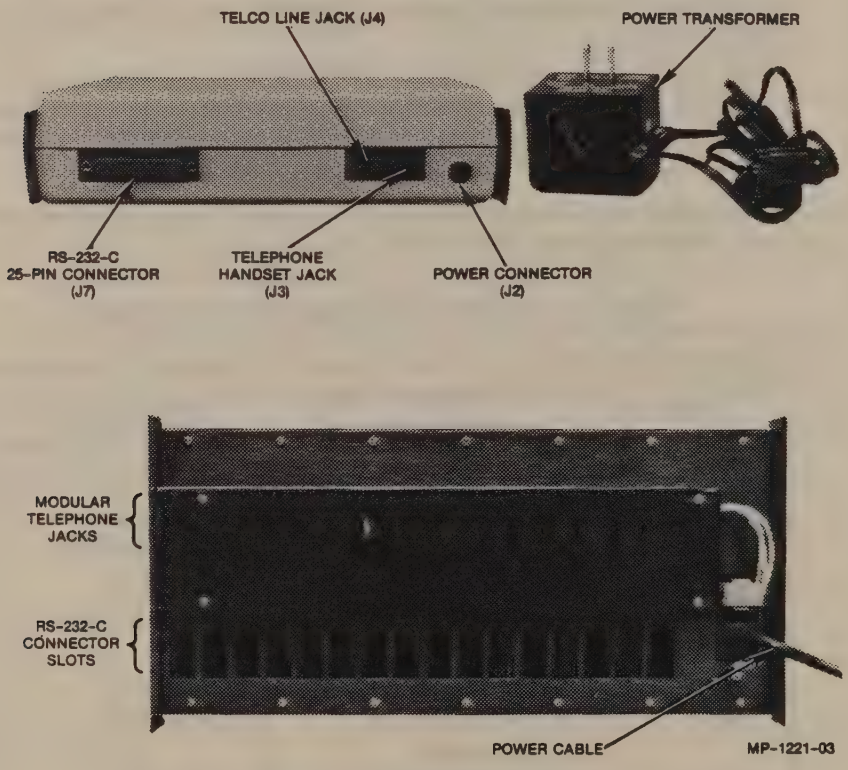


Figure 2-5. Cabling Connectors

2.7 APPLYING POWER TO YOUR MODEM

Power is applied to the standalone modem as soon as you plug the power transformer into the wall outlet. The card module doesn't receive power until you turn on the power switch on the front of the rack-mount chassis power supply module. *Don't apply power yet.*

CAUTION: Use only the power transformer supplied with your modem (M3024+). Attempting to use any other power supply module may cause damage to the unit or generate improper operation.

First, ensure that your modem is set for normal data operation. That is, check that all the test mode switches (S1-1 through S1-4) are OFF and set the DM switch to the out (voice) position. Then apply power. For the M3024+, first plug the cord into the modem and then the transformer into the wall; for the M3224+, set the rack-mount power switch ON. Your modem will go through a self-test as soon as power is turned on. The self-test takes approximately 3 seconds, then you should see the indicators go to the following conditions if the modem is working properly:

LS and **HS** — One indicator should be ON and the other should be OFF depending on the data speed you selected with operation switch S2-1.

MR — ON for 3 seconds, then goes OFF

OH — OFF

If the **LS** or **HS** indicator FLASHES, the modem is in a test mode. You may have left a test mode switch in its test position.

If the **MR** indicator FLASHES, the modem has failed the self-test. Disconnect the power cable and then reconnect it. If the **MR** indicator still FLASHES, call MICOM Customer Service (refer to the Customer Service page in the front of this manual for instructions).

SECTION 3
OPERATING YOUR MODEM LOCALLY

3.1 MANUALLY ORIGINATING CALLS WITH YOUR MODEM

To manually originate data calls with your modem (M3024+), you must have a telephone set connected to the RJ11C jack (J3) at the rear of the modem. Follow this sequence:

1. Release the DM switch. This is the voice position.
2. Set operation switch S1-6 (ANS) to OFF for originate mode.
3. Set operation switch S2-1 (LS) to OFF for 2400 bps or to ON for 1200 bps to match the DTE. Note that the **HS** or **LS** indicator goes ON accordingly.

NOTE: For asynchronous operation, this switch (S2-1) has a fallback rate of 1200 bps.

4. Verify that S2-3 and S2-4 are set to the correct character length.
5. Lift the telephone handset and dial the number as if you were making a voice call.
6. When you hear the answer tone from the answering modem, press the DM switch on your modem and hang up the telephone. The **OH** indicator should go ON.
7. The **MR** indicator will be ON when the connection is made to the remote modem in the data mode.

NOTE: You must hang up the phone within 3 seconds of pressing the DM switch to prevent generation of noise interference on the data line.

Sometimes the answering modem will be operated manually. In that case, use the following procedure.

1. Place the modem in the voice mode (release the DM switch), lift the telephone handset, and dial the number.
2. When the called party answers, verify character length, speeds of the modems, and that you are the originate modem. Set switch S1-6 (ANS) OFF for originate mode and ensure that the called party has placed S1-6 on his modem to ON to assume the answer mode. Set switch S1-1 (LS) to the speed selected for this operation and S2-3 and S2-4 to the correct character length.
3. The answer end should then place the modem in the data modem (press DM switch) and hang up the telephone.

4. When the originating party hears the answer tone, he should place his modem in the data mode (press DM switch) and hang up the telephone.

NOTE: You must hang up the phone within 3 seconds of pressing the DM switch to prevent generation of noise interference on the data line.

3.2 ANSWERING CALLS TO YOUR MODEM

You can set up your modem so that incoming calls are automatically answered or for manual answer. If you are not going to use the line to accept incoming voice calls, set up the modem for auto-answer mode and it can be left to accept data calls unattended. If you are going to use the line for incoming voice and data calls, use the manual answer mode.

3.2.1 Manually Answering Calls to Your Modem

To manually answer calls to your modem, release the DM switch to the voice position and answer the telephone as you would a voice call. Agree on modem speed, the originate and answer ends, and set up the data link as previously described in paragraph 3.1.

3.2.2 Setting Up Your Modem for Auto-Answer

To set up your modem for auto-answer, simply press the DM switch (data position). When Data Terminal Ready (DTR) from the connecting data terminal equipment is on, the modem will automatically answer incoming calls (refer to paragraph 4.5.1 for ring choices). If you leave the DM switch out (voice position), the modem will not automatically answer the call.

NOTE: The modem will monitor the RI signal whether S1-6 is set or not. As a convenience to the user, the modem will answer an *incoming* call even if S1-6 is OFF as long as the DM switch is in the data position.

3.3 DISCONNECT CONDITIONS

After data transmission is complete, you may disconnect the modems automatically or manually. The call disconnection conditions are as follows:

- Under DTR control, the modem will go on-hook if DTR is off for 50 ms (unless the modem is in a test mode). If Send Space Disconnect is enabled (S2-6 OFF), DSR will be off 68 ms after DTR is off and the modem will transmit continuous space for 4 seconds before it goes on-hook.

- If Carrier Loss Disconnect is enabled (S2-8 OFF), the modem will go on-hook when received carrier is absent for 433 ms. CTS and DSR will be off 433 ms after carrier drops.
- If Long Space Disconnect is enabled (S2-7 OFF), the modem will go on-hook when received data space is received continually for 1.6 seconds.
- At the answering modem, if received carrier is not detected in 18 seconds after DSR goes on, the modem will go on-hook.
- The modem will disconnect if signal quality is bad for 30 seconds.
- You can manually disconnect the modems by releasing the DM switch to the voice position and placing the handset on-hook.
- You can disconnect the modem by way of the Q command through your terminal.
- You can disconnect the modem by pressing the BREAK key five times in succession.

SECTION 4
OPERATING YOUR MODEM FROM THE DTE

4.1 AUTO-DIAL OPERATION

The auto-dial features of your M3024+ and M3224+ permit you to control the complete operation of the modem from the connecting DTE and provide a 20-address telephone number directory. With the directory, you can automatically dial any of the stored numbers by issuing a one- or two-digit command. Other one- or two-character commands allow you to set up the complete configuration of the modem, control the modem in either voice or data mode, and test the modem and its telephone link.

The auto-dial features include:

- A terminal-controlled modem (TCM) command and response set for use by human operators using ASCII terminals or microcomputers in ASCII terminal emulation mode
- A computer-controlled modem (CCM) command and response set for use by microcomputers and central-site host computers
- Menu-driven operation to lead you step-by-step through the required procedures
- Individual telephone number and logon sequence security or complete directory security
- Nonvolatile storage of directories and modem configuration settings
- Autospeed and auto-parity detection
- Mnemonic auto-dial from the directory
- Automatic redialing and linking of numbers in the telephone directory
- Command concatenation
- Any key abort function

The M3024+ and M3224+ respond to commands and telephone line operations with messages suitable for display on a terminal at the connecting DTE. In this section, messages and menus issued by the modem to the DTE are in **BOLD** type and commands and information that you enter are in *Italics*. Both are formatted here very closely to the way they would appear on a CRT terminal. CR is used to denote a carriage return.

4.2 POWERING UP WITH AUTO-DIAL

NOTE: The DM switch must be in the data position (locked in) to allow DTE control operation.

At power up, the modem goes through a self-check and its **MR** indicator goes ON if it is successful. At this point, the modem will remain in the idle mode until you take some action or it detects ringing and is in the auto-answer mode.

4.3 ENTERING THE COMMAND MODE

In the idle state, the modem only accepts one command, the "return to command mode" command. This is programmed into the modem at the factory as ∧E or control E. This is the only command you may enter at this time.

To enter the command from a keyboard, hold down the control key and enter a capital E. Release the control key and press the carriage return. When you enter the command, the modem issues one of two responses depending on its data rate and parity. If its data rate and parity do not match that of the DTE, it senses the configuration of the DTE, changes its data rate and parity to match, and issues the following message:

```
IDLE
∧ECR
XXXX BPS
YYYYY PARITY
MICOM DIALNET 3000 — M3024+
VERSION 1.0
TYPE HELP FOR HELP LIST OF COMMANDS, OR ANY VALID COMMAND!
>_
```

where: XXXX is the detected data rate,
YYYYY is the detected parity,
> is the Command Mode prompt, and
_ is the cursor on the terminal.

If the modem's data rate and parity match that of the DTE, then it responds to the "return to command mode" command with just the TYPE HELP. . .message. These messages only occur when you first enter the "return to command mode" command after power up. Subsequent use of this command only causes the modem to issue the command mode prompt, >.

A time-out timer begins running when the modem enters the command mode. If there is no command entered within 60 seconds of the command mode prompt (>_), the modem automatically returns to the idle mode.

As will be described in a later paragraph, you can redefine the "return to command mode" command. If you have done so and are powering up again, you use your redefined command to enter the command mode. If the modem's or DTE's data rate and/or parity have been changed, you must use the ∧E command as described above before entering your "return to command mode" command. When you enter the ∧E command in this case, the modem responds as described above and you may then use your redefined command to enter the command mode.

4.4 THE HELP COMMAND

After entering the command mode, enter HELP to view the available menus from the modem. You need only enter H CR; although HE CR, HEL CR, and HELP CR will all work. Before going further, a word about the display presentations in this section. We'll assume that your terminal scrolls up, as most do, to make room for the next line at the bottom. For the remaining display presentations, only necessary lines will be shown. Now, enter H CR. The modem responds with:

```
>HCR
HELP LIST OF COMMANDS

TYPE P TO PRINT THE COMMAND MENU
TYPE TM FOR TEST MENU
TYPE T FOR CONFIGURATION MENU
XXX = COMMAND MODE CHAR

>_
```

where: XXX is either ∧E (factory setting) or the user-defined return to command mode character(s) (up to three characters).

The modem again waits 60 seconds for you to type one of the menu commands. If you do not enter a command during this period the modem returns to IDLE mode. Entering P, TM, or T within 60 seconds will display the appropriate menu.

If you enter any characters other than the menu command characters during the 60-second period, the modem issues the following error message, repeats the HELP List of Commands, and restarts the 60-second response period:

I AM NOT PROGRAMMED TO RECOGNIZE THE COMMAND XX AT THIS LEVEL!

The characters XX will be your illegal entry.

4.5 SETTING YOUR MODEM'S CONFIGURATION

At this point, you should look at the configuration menu and set up your modem. Enter T CR if you have the command mode prompt. The modem will send the menu as follows:

> T CR

0. MASTER RESET, DEFAULT SETTINGS		**14. COMMAND ECHO**	**ENA**
1. ANSWER AFTER RING	**1**	**15. DTR FORCE ON**	**DISA**
2. COMMAND RESPONSE	**LONG**	**16. PIN 22 DEFINITION**	**RING**
3. SPEAKER	**ON**	**17. DATA TO CMD MODE**	**DISA**
4. LOCK DIRECTORY	**OFF**	**18. CMD MODE CHAR SELECT**	**^E**
5. LINE TYPE	**SW**	**19. CHARACTER LENGTH**	**10**
6. GUARD TONE	**DISA**	**20. RDL DETECT**	**ENA**
7. SEND SPACE DISCNT	**ENA**	**21. CD THRESHOLD**	**-43**
8. LONG SPACE DISCNT	**ENA**	**22. INTERDIGIT DELAY**	**50**
9. CARRIER LOSS DISCNT	**ENA**	**23. DISCNT ON LOW SPEED**	**DISA**
10. XMIT CARRIER	**CONT**	**24. SQUELCH XMIT CARRIER**	**DISA**
11. OPERATING MODE	**ASYNC**	**25. CMD MODE CHAR GUARD TIME**	**50**
12. EXTD ASYNCH RANGE	**DISA**	**26. FAILED CALL TIMER**	**30**
13. DSR ON DURING TEST	**ENA**	**27. DIAL MODE**	**TONE**

ITEM 1 1, NEXT: _

Each of the items in the configuration menu, except 0, has two or more choices. The choices already shown for items 1 through 27 are the default settings. These are the settings that are automatically selected and stored in the modem when you select item 0, Master Reset. To reset the commands to their default settings, enter:

0CR

The modem will respond with:

DEFAULT SETTINGS? (Y/N)

You must answer Y CR for yes, or N CR for no. If you enter X CR (where X is any character other than Y or N) or CR only, the default values will not be set.

CAUTION: If you answer Y, the memory will be cleared. Make sure this is what you want at this time, otherwise you will lose values you have already entered.

You may sequentially step through the configuration menu or select any item by number. If you answer the display:

ITEM 1 1, NEXT: _

with just a CR, the modem will respond with the next item on the menu and its current setting, for example:

ITEM 1 1, NEXT: *CR*
ITEM 2 LONG, NEXT: _

Pressing the space bar toggles the item through its choices (except items 4 and 18):

ITEM 2 LONG, NEXT: *SP*
ITEM 2 SHORT, NEXT: _

To make a selection, press the space bar until the choice you want is displayed. This will store your choice in nonvolatile memory. Pressing CR will cause the modem to send the next item and its current setting to the terminal. The process will continue until you have stepped through the entire menu. After you respond to item 27 with a CR, item 1 and its setting are again sent to the terminal. Item 0 is skipped. You must explicitly select item 0 by entering 0 CR. You may also select any item in the menu by entering its item number followed by a CR.

ITEM 3 ON, NEXT: *19 CR*
ITEM 19 10, NEXT: _

If you just enter CR, the modem then sequences through the remaining items of the menu from that point. To leave the menu, you must enter the "return to command mode" command.

The configuration setting choices are:

	Default	Options
Answer After Ring	**1**	**2, 3, 4, 5, N**
Command Response	**LONG**	**NONE, SHORT**
Speaker	**ON**	**OFF**
Lock Directory	**OFF**	**ON**
Line Type	**DIAled**	**DEDicated**
Guard Tone	**DISAbled**	**ENAbled**
Send Space Discnt	**ENAbled**	**DISAbled**
Long Space Discnt	**ENAbled**	**DISAbled**
Carrier Loss Discnt	**ENAbled**	**DISAbled**
XMIT Carrier	**CONtinuous**	**SWitched**
Operating Mode	**ASYNChronous**	**SYNChronous**
Extd Asynch Range	**DISAbled**	**ENAbled**
DSR On During Test	**ENAbled**	**DISAbled**
Command Echo	**ENAbled**	**DISAbled**
DTR Force On	**DISAbled**	**ENAbled**
Pin 22 Definition	**RING**	**ANSwer**
Data to Command Mode	**DISAbled**	**ENAbled**
Cmd Mode Char Select	**^E**	**user defined**
Character Length	**10**	**8, 9, 11**
RDL Detect	**ENAbled**	**DISAbled**
CD Threshold	**-43**	**-26**
Interdigit Delay	**50**	**100, 650, 1000**
Discnt on Low Speed	**DISAbled**	**ENAbled**
Squelch XMIT Carrier	**DISAbled**	**ENAbled**
Cmd Mode Char Guard Time	**50**	**100, 650, 1000**
Failed Call Timer	**30**	**60**
Dial Mode	**TONE**	**PULSE**

Each of the configuration items and their choices are described in the following paragraphs.

4.5.1 Answer After Ring

This item allows you to select the number of rings that your modem must detect before it automatically answers an incoming call. The choices are 1, 2, 3, 4, or 5 rings or Never. If you select Never, your modem will not automatically answer calls.

4.5.2 Command Response

If you select LONG for this item, all responses from your modem will be in long form, i.e., in English form. If you select SHORT, certain responses will be shortened to single numeric digits. These short forms are categorized in the Modem Responses Summary in paragraph E.2.

If you select NONE, no commands will be displayed. This item is normally used for a computer site, and is NOT recommended for standard uses.

4.5.3 Speaker

Selecting ON turns your modem's speaker on, selecting OFF turns it off. When on, the speaker operates whenever your modem is not in the data mode.

4.5.4 Lock Directory

If item 4 is OFF, entering a space will cause the modem to prompt:

ITEM 4 OFF, NEXT: ***SP***
ITEM 4 OFF, PASSWORD? _

You can then enter up to an 8-character string as a password or just CR to leave directory unlocked. If a password is entered, the modem responds with:

ITEM 4 OFF, NEXT: ***SP***
ITEM 4 OFF, PASSWORD? ***XXXXXXXXCR***
ITEM 4 ON, NEXT: _

Your directory is now locked and may not be entered unless the correct password is entered. To enter your directory, select the configuration menu and item 4. The modem responds with:

ITEM 4 ON, NEXT: ***SP***
ITEM 4 ON, PASSWORD? ___

If you enter the correct password:

ITEM 4 ON, PASSWORD? ***XXXXXXXXCR***
ITEM 4 OFF, NEXT: _

You may now enter your directory. If the incorrect password or no password is entered, the directory remains locked and may not be used. When you are finished with the directory, it must be relocked by selecting the configuration menu and reentering your password in item 4.

If you have forgotten your password, you may unlock the directory by way of the Master Reset command. Enter 0 CR and the configuration menu will reset to its default settings. Your directory entries will be ERASED, and the directory will then unlock. You may then go to item 4 and enter a password.

4.5.5 Line Type

This selection sets up the modem to operate on one of two types of telephone lines. If you are operating in the Direct Distance Dialing (DDD) network, choose DIAled. If you are operating over a private or leased line, choose DEDicated.

4.5.6 Guard Tone

The guard tone is an 1800 Hz tone that is transmitted with the high channel of the modem when ENAbled is chosen. The tone is used only in a few specific applications, such as required by certain European systems, and should normally be DISAbled.

4.5.7 Send Space Disconnect

When you choose ENAbled, the local modem sends to the remote modem a 4-second period of spacing before disconnecting from the line. If you choose DISAbled, the modem disconnects without sending any spacing. This item should be set to match the requirements of the remote modem.

4.5.8 Long Space Disconnect

When you ENAble this item, your modem disconnects from the line anytime it receives 1.6 seconds of continuous spacing from the remote modem. If you choose DISAbled, your modem remains on the line regardless of any incoming spacing. If you are communicating with a remote modem which has both of the space disconnect features, both features should either be enabled or disabled at both modems.

4.5.9 Carrier Loss Disconnect

If you choose ENAbled for this item, your modem will disconnect from the line if it loses incoming carrier continuously for 433 ms or more. If DISAbled, your modem will not disconnect because of loss of incoming carrier. This feature, and the space disconnect features above, are normally enabled on your modem and the remote modem with which you are communicating.

4.5.10 XMIT Carrier

When you select CONtinuous for this item, your modem continuously transmits a carrier in off-hook, even when it is not sending data. If you choose SWitched, your modem's transmit carrier is off and switches on only when it is sending data (when the connecting terminal equipment turns on Request-to-Send to the modem). You would select CONtinuous if your terminal equipment does not supply RTS to your modem or if the remote modem disconnects on loss of carrier.

4.5.11 Operating Mode

You must set this item to match the requirements of the connecting terminal. If your modem is connected to an asychronous channel of your terminal equipment, select ASYNC. If it is connected to a synchronous channel, select SYNC. During command mode, all commands are treated as if they are asynchronous ASCII characters regardless of the settings.

4.5.12 Extended Asynchronous Range

If you select asynchronous mode and DISAbled for this item, your modem will expect data from your terminal equipment to be within ±1% of the selected speed. Choosing ENAbled will permit your terminal to vary ±2.3% from the selected speed.

4.5.13 DSR On During Test

If you choose ENAbled for this item, Data Set Ready (DSR) is forced on in your modem when your modem is placed in any test mode. Selecting DISAbled causes DSR to be forced off in all test modes.

4.5.14 Command Echo

If you select ENAbled for this item, all commands that you enter into your terminal will be returned to your terminal by your modem for your verification. Most terminals are equipped with a "local copy" option which performs the same function. When both are enabled, you will see double characters displayed for your commands. If you do, disable either "local copy" or "command echo." If nothing appears on your terminal when you enter commands, select ENAbled for command echo.

4.5.15 DTR Force On

You should set this configuration item according to the capabilities of your terminal equipment. If your terminal supplies Data Terminal Ready (DTR) to your modem, select DISAbled. If it does not, select ENAbled to force DTR on internally. DTR must be on to transmit data. See also XMIT Carrier.

4.5.16 Pin 22 Definition

If you select RING for this item, your modem will turn on the Ring Indicator (RI) signal on pin 22 at your terminal interface when your modem detects ringing. If you select ANSwer, your modem will turn on pin 22 when it is in the answer mode. This does not affect the responses your modem sends to the terminal.

4.5.17 Data to CMD Mode

When you select DISAbled for the Data to CMD mode, the modem will change from data mode to command mode when requested. Selecting ENAbled will keep the modem in data mode.

4.5.18 Command Mode Characters Select

If you choose ∧E for this item, you must type (control) E on your terminal to enter the command mode. If you select "user defined," you must enter your own command code as follows:

ITEM 18 ∧E, NEXT: ***ABC CR***
ITEM 18 ABC, NEXT: _

You may enter any combination of 1, 2, or 3 characters (followed by CR), not including CR (carriage return), LF (line feed), SP (space), BS (backspace), and BS, and RUB (rubout or erase), to be your "return to command mode" command. If you attempt to enter more than three characters, the modem will accept only the first three.

After you enter a valid combination, the command is stored in nonvolatile memory in the modem and is displayed whenever you select the HELP list or the configuration menu.

NOTE: In the event you forget your user-specified "return to command mode" character(s), use the following procedure to view what is stored in nonvolatile memory.

1. Release the DM switch to the out position.
2. Press the DM switch to the in position.
3. Wait for the **MR** indicator to light (approximately 3 seconds).
4. Type ∧*ECR*.

The modem will respond with the TYPE HELP FOR HELP LIST OF COMMANDS message. Type HCR. The HELP menu will be displayed and will include your user-defined "return to command mode" character(s).

Another procedure is as follows:

1. Unplug the power cord from the modem and wait 5 seconds.
2. Plug the power cord into the modem.
3. Check that the DM switch is pressed in.
4. Wait for the **MR** indicator to light (approximately 3 seconds).
5. Type ∧*ECR*.

The modem will respond as described in the previous procedure.

4.5.19 Character Length

This item allows you to select the number of bits per character that your modem expects to receive from your terminal and send to your terminal. Character length is determined in your modem at auto-speed detect after initial power up and need not be changed unless you change the character length of your terminal without powering down your modem. In command mode, character length will be 9, 10, or 11 bits (7 or 8 data bits, 1 start bit, and 1 or 2 stop bits) regardless of character length in the data mode. The Command Port of your computer must be configured for 9 or 10 bits.

4.5.20 RDL Detect

When you ENAble this item, your modem will respond to a Remote Digital Loopback (RDL) command from the remote modem. When it does, it automatically disconnects from your terminal and connects its receiver output into its transmitter input so that it may be tested from the remote modem and terminal. Refer to paragraph 4.14 (Test Menu) for a more detailed description of RDL. If the item is DISAbled, your modem will not respond to the remote command.

4.5.21 CD Threshold

When you are operating over a private or leased line, you may select a dBm level of either -43 or -26 for the Carrier Detect (CD) threshold. If you have selected ENAbled for Carrier Loss Disconnect and -26 for the CD threshold, and your modem disconnects frequently while receiving data, then change this setting to -43. If you have selected DIAled for Line Type, the CD threshold should be set to -43 dBm in your modem.

4.5.22 Interdigit Delay

Interdigit delay is the delay inserted by your modem between tones in tone dialing. If you are experiencing problems with tone dialing, select another delay. Different delays are required by different phone systems. This setting does not affect pulse dialing. For pulse dialing: break = 60 ms, make = 40 ms, and interdigit delay is fixed at 650 ms.

4.5.23 Disconnect on Low Speed

When set to ENAbled, the modem will disconnect from the line if the modem at the remote end is operating at 1200 bps. When set to DISAbled, the modem will sense the data rate of the remote modem and adjust its speed accordingly.

4.5.24 Squelch XMIT Carrier

When set to ENAbled, the modem transmit carrier is turned off. This would be used if the modem is connected in a receive data only applicaton. When set to DISAbled, the transmit carrier operates normally. The feature is used mainly for test purposes.

4.5.25 Command Mode Characters Guard Time

The command mode characters guard time prevents a data string from your terminal from inadvertently switching your modem to the command mode. The selections are in milliseconds and specify the time of no activity from the terminal that immediately precedes and follows the "return to command mode" character(s). That is, if you select 1000, then there must be 1 second of no activity before you send this "return to command mode" character and 1 second after the "return to command mode" character before you press CR. Otherwise, your modem will interpret the characters as data. You must remember to wait the selected time interval, after entering the command mode characters, before you press CR.

4.5.26 Failed Call Timer

The failed call timer setting determines the amount of time (in seconds) that your modem will wait for its outgoing call to be answered. When the time exceeds that selected, your modem hangs up and executes the next command; retry, alternate number, etc.

4.5.27 Dial Mode

When you select TONE or PULSE for this item, your modem will use tone or pulse dialing accordingly.

4.6 YOUR MODEM'S COMMANDS

After you have set your modem's configuration, you are ready to enter commands to set up your directories and operate the modem. You can have your modem display the entire command set by entering P CR. Remember, you must be in the command mode. So if you are not, enter your "return to command mode" character(s) first. Your modem responds to the P command as follows:

```
>P CR
COMMAND MENU     MICOM 3024+     VERSION 1.0

1 TO 20 = DIAL PHONE # DIR ADR 1 TO 20
A    = GO OFF-HOOK IN ANS MODE
C    = CHANGE/STORE/CLEAR DIR
CL   = CHANGE/STORE/CLEAR LOGON DIR
D    = KEYBOARD DIAL PHONE #
H    = DISPLAY HELP LIST
I    = GO TO IDLE MODE
M    = DISPLAY DIRECTORY MEMORY
ML   = DISPLAY AUTO-LOGON DIR
O    = GO OFF-HOOK IN ORIG MODE
P, ? = PRINT COMMAND MENU
Q    = GO ON-HOOK (QUIT)
R    = REDIAL LAST #
T    = CONFIG MENU
TM   = TEST MENU
SPECIAL CHAR:  B, V, ;,  , !, @, $, &, ?, '
```

You must be in the command mode to use the above commands and you must follow all of them with a CR. Note that P or ? will call up the command menu. The uses of the commands and special characters are described in the following paragraphs. The commands are summarized in appendix C, the special characters in appendix D, and the modem's responses in appendix E.

4.7 SETTING UP YOUR TELEPHONE DIRECTORY

The first operation you will want to perform after you set your modem's configuration is to prepare your telephone number directory. However, before initially entering your directory, it is a good idea to organize it first by writing it out on paper. The number directory memory should be empty when you first get your modem. To see that it is, enter M CR. The modem should respond with just the directory headings as follows:

```
>MCR
NUMBER DIRECTORY

   NAME        PHONE NUMBER        REDIALS  LINKED#     LOGON ADR
>_
```

4.7.1 The C (/Store/) Command

To store a number in your number directory, use the C command and the modem will respond as follows:

```
>CCR
ADDRESS?_
```

You enter the address (from 1 to 20) at which you want to store the number, followed by CR. If you enter CR only, the next available address in memory will be used. The modem will respond:

```
>CCR
ADDRESS? 1CR
NEW NUMBER?
```

You enter the new number using parentheses and dashes within the number to make it more legible; your modem ignores these. Do not use spaces in these number entries. After you enter the number the modem prompts:

```
>CCR
ADDRESS? 1CR
NEW NUMBER? (415)747-1980CR
MNEMONIC?
```

You can press only CR for no entry, or enter a name up to seven alphanumeric characters long and CR. The mnemonic must not include control characters. If you enter more than seven characters, your modem will only store the first seven. When you press CR, the modem responds with:

```
>CCR
ADDRESS? 1CR
NEW NUMBER? (415)747-1980CR
MNEMONIC? Tymshr1CR
NUMBER OF RETRIES?
```

Here you enter a digit from 0 to 9 for the number of times you want the modem to retry dialing the number. If you just enter a CR, the modem will store for NO retries; if you enter a number greater than 9, the modem will store for 9 retries. After you enter the number of retries, the modem prompts:

```
>CCR
ADDRESS? 1CR
NEW NUMBER? (415)747-1980CR
MNEMONIC? Tymshr1CR
NUMBER OF RETRIES? 3CR
LINK NUMBERS?
```

The modem is asking which other numbers in your directory you want dialed if this current number is not answered after the number of retries you specified. You then enter the one- or two-digit directory location of the number. You can enter as many directory locations as you wish as long as you do not link back to one of the numbers you enter here. For example:

NEW NUMBER? ***(415)747-1980CR***
MNEMONIC? ***Tymshr1CR***
NUMBER OF RETRIES? ***3CR***
LINK NUMBERS? ***2SP12CR***
>_

This is the last entry in the sequence and the modem returns the command prompt to the terminal.

You do not have to enter the linked locations when you first build your number directory. If you just respond to the LINK NUMBERS? prompt with a CR, no links are stored. You can always go back and change the entry after you fill in your directory. The change part of the C command is described in paragraph 4.7.2.

To verify your entry, use the M command again and the modem will send the stored information to your terminal as follows:

>MCR
NUMBER DIRECTORY

	NAME	PHONE NUMBER	REDIALS	LINKED#	LOGON ADR
1.	TYMSHR1	(415)747-1980	3	2	NO LOGON

>_

If you do not specify an address, the modem automatically stores the information in the first empty location in your directory. The second number you enter will be stored at location 2, etc. Also, if you do not enter retries or linked numbers, NO is automatically entered by the modem in the appropriate columns.

It was stated in paragraph 4.1 that the number directory would hold 20 entries. That is the maximum number of addresses. The directory memory is limited but it is dynamically allocated. That is, your entries are put into the memory until it is full. If you enter a lot of long telephone number sequences, the memory can fill up before you get to 20 locations. When this happens, the modem prompts:

MEMORY FULL!
>_

NOTE: If you encounter a MEMORY FULL! message when entering a change to an existing number, you will lose the existing number as well as the changed number.

4.7.2 The C (Change/Clear Dir) Command

The C command is also used to change or delete an entry in your number directory or to clear the entire directory. To change an entry, go to the command mode and enter CR. The modem will respond:

```
>CCR
ADDRESS?
```

Now, you enter the directory address of the number to be changed. If you enter an address that is outside the address range of 1 to 20, the modem prompts ILLEGAL ADDRESS! and redisplays the ADDRESS? prompt. A legal address entry causes the modem to respond with:

```
>CCR
ADDRESS? 1CR
OLD NUMBER: (415)747-1980
NEW NUMBER?
```

Enter the new number and press CR. The modem responds with:

```
>CCR
ADDRESS? 1CR
OLD NUMBER: (415)747-1980
NEW NUMBER? B(415)B747-1980 CR
MNEMONIC?
```

From here on, the modem continues the prompts just as previously described for storing a number. If all you wanted to do was add the blind dialing character in front of the number, the entire change sequence would be:

```
>CCR
ADDRESS? 1CR
OLD NUMBER: (415)747-1980
NEW NUMBER? B(415)747-1980CR
MNEMONIC? Tymshr1CR
NUMBER OF RETRIES? 3CR
LINK NUMBERS? 2 SP12CR
>_
```

You must reenter all information even though you are only changing the number. After you have finished making the changes, enter the M command to display the directory and verify that the changes are correct.

If you enter CR only in response to the NEW NUMBER? prompt, the modem will prompt:

```
>CCR
ADDRESS? 1CR
OLD NUMBER: (415)747-1980
NEW NUMBER? CR
CLEAR NUMBER? (Y/N)
```

If you enter YCR, the number, mnemonic, retries, links, and logon addresses at that address are cleared, and the message NUMBER CLEARED! will be displayed. If you type NCR, or any other character and CR, or CR only, the modem will NOT clear the number and will return to the command prompt.

To clear the entire directory without using the Master Reset, enter the C command and respond to the ADDRESS? prompt with a 0CR. The modem will then prompt:

```
>CCR
ADDRESS? 0CR
CLEAR ENTIRE DIRECTORY? (Y/N)
```

If you respond with YCR, the modem clears the entire number directory memory, issues the prompt MEMORY CLEARED!, and returns the command prompt. You can abort this clear command by responding to this last prompt with any character other than Y, followed with a CR, or just a CR.

If you have a printer connected to your terminal equipment, make a hard copy of your number directory for filing. Do this both after you initially enter it, and after you make changes to it. This file copy will come in handy if you have to unlock the directory with the Master Reset or if you inadvertently clear it with the C command.

CAUTION: The modem requires up to a 3-second period to restructure its memory after each C command and CR before returning the command prompt (>__). If power is interrupted to the modem during this period, its memory may incorrectly store entered data. If this occurs, recheck the memory and reenter data as required. If any doubt exists, clear the entire memory and reenter all data.

4.7.3 Special Characters in Your Number Directory

You may embed any of the following special characters in the telephone numbers you store in your directory:

B	Blind dialing
V	Switch to voice mode
;	Stay in online command mode
@	Mask the telephone number
$	Switch to pulse dialing
&	Switch to tone dialing
	Do not send CR at end of logon string
!	Wait for response before logon
,	Time delay function in auto-logon

The B character tells your modem to institute blind dialing, that is, dial the number following even though it cannot detect a dial tone. It is used primarily for dialing through PABX's or independent telephone company lines which use a non-standard dial tone. When B is encountered in a number, your modem waits five seconds before it starts or continues dialing. If you are working your modem on such a PABX or Telco line, use the B as the first character in each of your stored numbers.

Unless you tell your modem differently, it only makes data calls. The V character must be used as the last character in a telephone number that is used only for voice communication. After you store all of your numbers for data calls, you can use the remaining memory for the numbers of voice calls that use this character at the end of each number. If your modem's speaker is on, you will hear the called party answer. You can then pick up your phone and talk. Press any key to turn off the modem's speaker. To return to the command mode after the telephone handset is on-hook, simply press any key on the DTE keyboard.

The ; character inserted at the end of a stored number causes your modem to stay online after completing its handshake with the remote modem, but it returns to the command mode. This could be used to change your modem's configuration before continuing with a data call, or it could be used to place your modem or the remote modem in a test mode online.

When @ is entered as the first character of a telephone number, it tells your modem to mask the number for display. For example, if you stored @6174081234 at address 2 in your directory, the M command would produce the following:

```
>MCR
NUMBER DIRECTORY

     NAME        PHONE NUMBER     REDIALS   LINKED#   LOGON ADR
1.   TYMSHR1     (415)747-1980    3         2         NO LOGON
2.               @@@@@@@@@@       NO        12        NO LOGON
>_
```

In addition, when the number is to be displayed during dialing it will appear as a string of @ characters.

The $ and & characters are used in your telephone numbers when the modem must switch dialing modes during a dial sequence. The $ character tells your modem to use pulse dialing for all following digits. The & character tells it to use tone dialing for all following digits.

The modem only responds to these special characters when they are included in a telephone number. If entered as commands in the command mode, they will cause the modem to send an error message to the terminal.

4.8 MAKING A DATA CALL FROM YOUR DIRECTORY

To make a data call from your number directory, enter the command mode with your "return to command mode" characters, and then enter the directory address or the mnemonic of the number you wish to call and press CR. As soon as you press CR, your modem goes off-hook and starts dialing the number. During the progress of the call, your modem sends messages to your terminal to let you know what is happening. A typical message sequence is:

```
IDLE
^ECR
>_
>ICR
DIALING 4097271980
ONLINE XXXX
```

If the call is successful on the first attempt, each of the above messages are sent to your terminal once by the modem. When your modem starts dialing the number, it issues the DIALING... message followed by the number dialed. It sends the ONLINE XXXX message when it completes the handshake with the remote modem. In this last message, XXXX will be the data rate selected during the handshake, either 2400 or 1200 bps.

During another call, your modem might prompt:

```
IDLE
^E CR
TYMSHR1 CR
DIALING 4157471980
DIALING 4157471980
DIALING 4157471980
LINKING!
DIALING 4157472325
LINKING!
DIALING 4082351980
FAILED CALL!
```

In this sequence, the number at the first address, Tymshr1 in your directory, was dialed three times. Your modem received a busy signal the first two times. When there was no answer the third time, it started dialing the linked number. It broke dial tone for the first part of the linked number but could not detect dial tone on the second line. Since this number was only to be tried once, the modem hung up and then tried the second linked number. A person answered the second linked number and your modem prompted FAILED CALL! after the abort timer timed out. If your modem's speaker was on, you would also hear the party answer.

The Any Key Abort feature of your modem permits you to abort a data call during the dial sequence (before carrier is detected) by pressing any key on your terminal or sending any character to your modem. Your modem will immediately hang up and return the command mode prompt.

4.9 MAKING CALLS FROM YOUR TERMINAL KEYBOARD

You can dial numbers directly through your terminal's keyboard by entering the D or dial command in the command mode. Your modem responds as follows:

```
>D CR
NUMBER? 94457645 CR
DIALING 94457645
```

After you enter the command, your modem prompts you for the number. You enter the number with any of the special dialing characters previously described and press CR. If any other character is entered, followed by CR, the modem will return to the command mode.

4.10 THE R (REDIAL) COMMAND

Every time that you dial a number, either from your directory or the keyboard, the number is stored in a redial buffer in your modem. The buffer always contains the last number that was dialed. If you want to redial that last number, you simply enter RCR. The modem responds:

```
>RCR
NUMBER OF RETRIES?
```

Here, you enter 0 through 9 and a CR, or just a CR for none. Your modem then dials the number and displays it as it is dialed.

4.11 MAKING DATA CALLS WITH VOICE COORDINATION

When making data calls to modems which are not set up for auto-answer, you use your telephone to place a voice call to the party, agree with the party on which will be the answer modem and which will be the originate, and set the modems accordingly. To do this, you must be in the command mode and you must use the A or O command. The A command forces your modem to go off-hook in the answer mode; the O command forces your modem to go off-hook in the originate mode. After entering one of the commands, followed with a CR, hang up your phone and proceed with data transmission. To use these commands in directory dial, you should have a semicolon (;) at the end of the number in the directory. This places the modem in the command mode after it goes off-hook.

4.12 AUTO DIALING VOICE CALLS WITH YOUR MODEM

Most likely, you will not use all 20 numbers in the directory for calls to computer systems. If you connect a telephone to your modem, you can store frequently called business and personal telephone numbers in the unused addresses, and auto-dial them. When you include the V character as the last character in these numbers, it tells the modem you are making a voice call. When the number is dialed, you can monitor call progress on the speaker. When the called party answers, pick up the telephone handset and start your conversation. Press any key on the keyboard to shut off the modem speaker after the called party answers.

4.13 SETTING UP YOUR LOGON DIRECTORY

After you have completed entering all the numbers in your telephone number directory, you will want to start storing the appropriate logon sequences in your logon directory. When you first power up your modem, the logon directory should be empty.

4.13.1 The ML (Display Auto-Logon Directory) Command

The ML command will display the logon directory. Your modem should respond:

```
>MLCR
LOGON DIRECTORY
>_
```

This indicates that the directory is empty.

An example of the logon directory is as follows:

```
LOGON DIRECTORY
1.
  !
  '84193
  !
  '86 LOGIN
  •
  •
  •
  •
2.'80
  !
  '85125
  !
  •
  •
  •
  •
  •
```

If your logon directory display is over 19 lines, the first 19 lines will be displayed and the 20th line will be:

.....CONTINUE?

You must enter N in order to exit to the command prompt, > . Otherwise, the modem will start to display the last incompletely displayed logon sequence for another 19 lines until all logon sequences are displayed. ML1 through ML20 will be used to display the specific logon sequences of 1 through 20.

4.13.2 The CL (Change/Store/Clear Logon Directory) Command

Each logon sequence stored in the directory must be associated with an address in the telephone number directory. To store a logon sequence in the directory, use the CL command:

```
>CLCR
ADDRESS?
```

If you wish to clear the logon directory, use the following steps.

```
>CLCR
ADDRESS: 0CR
CLEAR LOGON DIRECTORY?(Y/N)YCR
LOGON DIRECTORY CLEARED!
>_
```

If you type in any other response than Y, the modem will not clear the logon directory but will prompt with > only.

If you wish to store a logon sequence, use the following steps.

```
>CLCR
ADDRESS?XXCR  (XX = 1 thru 20)
NEW LOGON? (OR ENTER CMD MODE CHAR TO EXIT)
                !CR
                !CR
                '83103CR
                !CR
                '86LOGINCR
                !CR
                '84ABCDCR
                !CR
                '8412345CR
                ^ECR
LINK NUMBERS?CR,XXCR OR XX YY . . .ZZCR
where: XX,YY,ZZ = 1 thru 20
Special characters ',!,\,@ are defined in appendix A.
```

If you wish to change a logon sequence, use the following steps.

```
>CLCR
ADDRESS?XXCR  (XX = 1 thru 20)
OLD LOGON:
                !
                '83107
                !
                '86LOGIN
                !
                '84ABCDE
```

```
NEW LOGON?
          !CR
          '83103CR
          !CR
          '86LOGINCR
          !CR
          '84ABCDCR
          !CR
          '8412345CR
```

If you wish to delete a logon sequence, use the following steps.

```
 CLCR
ADDRESS?XXCR
OLD LOGON:
          '83107
          !
          '86LOGIN
          !
          '84ABCDE
NEW LOGON? (OR ENTER CMD MODE CHAR TO EXIT)
          XXXCR
            or
          ^ECR (CMD MODE CHAR)
CLEAR LOGON?(Y/N)YCR
LOGON CLEARED!
>
```

4.13.3 Pointers on Setting Up Your Auto-Logon Directory

There are a number of subtleties involved with storing auto-logon sequences, and you should become aware of how each system responds to logon commands before storing your logon sequences. The following procedure may save you considerable frustration.

1. Manually log on to your system and write down each step that occurs. Be sure to write down the computer messages, as well as your inputs, in the exact sequence that they occur. Use a symbol to indicate your use of the ENTER or RETURN key (<CR> is a good one).
2. Manually log on to your system several times to get experience with the delays (if any) that occur between the time you send a sequence to the computer and you get the expected response back from the computer.
3. Write down, in sequence, your inputs to the computer to log on. Then add the special characters necessary to control the flow of inputs to responses.

4. Use the CL command to store your logon sequence in the Logon Directory. Remember, you must use the same address in the Logon Directory as the address of the telephone number for the computer system stored in your phone directory.

Two examples may help you to visualize this process. Please briefly review appendix D for the meaning of the Logon Directory special characters \ , !, and '.

Example 1:

This computer system sends a message to the terminal immediately after the modem connects, then the logon proceeds normally. The actual logon appears as follows (H = host computer, U = user inputs, M = modem messages):

M: **ONLINE! 2400**

H: **XXXXX@!XXX@!XXX**

U: ***A*** **(without a carriage return)**

H: **-2470-033-**
please log in:

U: ***PHCR***

H: **TERMINAL EMULATOR**
00 vt-100-a
01 ADM3A
02 SCANSET
03 TELEVIDEO
04

U: ***03CR***

H: **WELCOME TO PHINET!!**
PRESS RETURN TO CONTINUE

U: ***CR***

H: **[Displays a menu of choices]**

You would store this at the Logon Directory address corresponding to the host telephone number address in your Number Directory.

```
>CLCR
ADDRESS?XXCR   (where XX = 1 through 20)
NEW LOGON?!
                A \ CR
                !
                PHCR
                !
                03CR
                !
                CR
                ^E
>
```

Note that CR is NOT displayed by the modem, so the entry will actually appear on the screen as:

```
NEW LOGON?!
          A\
          !
          PH
          !
          03
          !
          ^E
```

Example 2:

In this example, you must send characters to the computer immediately after going on-line.

```
M: ONLINE! 2400
U: CRCR
H: TELENET
   408 10U
U: CR
H: TERMINAL=
U: CR
H: @
U: TEST CHARCR
```

You would store this at the appropriate address as:

```
>CLCR
ADDRESS?XXCR
NEW LOGON?CR
          CR
          !
          CR
          !
          CR
          !
          TEST CHAR CR
          ^ECR
>
```

Note that entering CR by itself both stores the CR character in the directory and executes a CR line feed to take you to the next entry line. The entries for Example 2 would thus appear on the screen as:

NEW LOGON?

!

!

!

TEST CHAR

^E

If your system responds rapidly to inputs from the terminal, logons similar to the examples shown will execute very rapidly and accurately. Some systems, however, will have varying delays between the time you type an entry and the host computer responds. For those cases, you may program various delays into your logon sequence to ensure that a response is fully received from the host before the next entry is sent from the Logon Directory. You may set up a delay by inserting the string '8X (where X = 0 through F) at the beginning of a logon string you want delayed. Appendix F shows the time delays associated with the strings '80 through '8F.

It is suggested that you sign into your system manually at least 10 times at various times of the day and estimate the delays encountered. Then, when you enter the logon strings in the Logon Directory, you can program in delays, as required, that are a little longer that the worst case experienced during the manual logons.

Example 3:

This is the same as Example 1, except we assume there are delays in receiving responses from the host computer.

M: ONLINE! 2400
(1 second delay, worst case)

H: XXXXX@XXX@!XXX

U: *A* (without a carriage return)
(2 second delay, worst case)

H: -2470-033-
please log in:

U: *PHCR*
(no delay)

H: TERMINAL EMULATOR
00 vt-100-a
01 ADM3A
02 SCANSET
03 TELEVIDEO
04

U: *03CR*
(.5 second delay, worst case)

H: WELCOME TO PHINET!!
PRESS RETURN TO CONTINUE

U: *CR*

H: [Host responds with menu choices; logon complete]

To accommodate the delay times, you would store this sequence using delay values selected from appendix F.

```
>CLCR
ADDRESS?XXCR   (where XX = 1 through 20)
NEW LOGON?!
              '85A CR
              !
              '86PHCR
              !
              03CR
              !
              '84CR
              ^ECR
>
```

If, during actual execution of the auto-logon, you find responses are faster than expected, you may abort the programmed delays simply by pressing the S key when the correct response is received. The modem will immediately send the next string in the logon sequence.

Study these examples carefully, then experiment with programming the logon to your host system. After a few tries, you will find it easy and convenient to do. You will experience the convenience of auto-dialing and logging on to your system with only two or three keystrokes.

4.14 TEST MENU

The last command mode command to be described is the TM or test menu command. When you enter this command, the modem responds with:

```
>TMCR
TEST MENU
1. DOT MESSAGE
2. FOX MESSAGE
3. ANALOG LOOPBACK/MAKE BUSY
4. DIGITAL LOOPBACK
5. REMOTE DIGITAL LOOPBACK
   SELECT TESTS?
```

You can place your modem in any one test mode or any valid combination of test modes by entering X X ... XCR, where X is the menu number of the test modes. A space must be entered between menu items. If you enter an invalid combination, your modem goes to the last mode in the combination. Any test mode except 4 (DL) may be terminated by entering your "return to command mode" characters.

When tests 1, 3, 4, and/or 5 are selected, the modem prompts TEST PERIOD IN SECONDS:. You type in the desired duration of the test, or F (for forever), followed by CR. The modem then executes the test for the specified period of time.

NOTE: When test 4 (DL) is selected, the modem is isolated from the DTE. It is impossible to end the test from the keyboard.

When DOT MESSAGE (1) is selected, your modem transmits alternate 1s and 0s. If the modem is in analog loopback or remote digital loopback, its front-panel MR indicator goes ON when it detects errors in the received signal. Selecting DOT MESSAGE also clamps Received Data (RD) to your terminal at the Mark condition.

When you select FOX MESSAGE (2), your modem prompts:

SELECT TEST? *2CR*
NUMBER OF TIMES SENT? *XXXCR*

You respond to the prompt with any number from 1 to 127 (XXX) or the character F (for "forever"). If you select a specific number of messages, the modem returns the test menu to the terminal after they have been sent. This selection does not clamp the RD lead to Mark. The Fox Message is THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG, 0123456789. Press any key to terminate the FOX message.

The analog, digital, and remote digital loopback test mode configurations are described in section 5 of this manual.

4.15 MASK TELEPHONE AND LOGON DIRECTORY ENTRIES

You may review the telephone or logon directory by typing the M or ML command. Wherever you enter the @ character within a telephone number or logon sequence string, everything following the @ will be masked when displayed.

4.16 LOCK TELEPHONE AND LOGON DIRECTORIES

The Lock Directory option is used to lock or unlock the telephone and logon directories. It is entered through the configuration mode. If the directory is locked, the display and edit functions are not allowed. You must enter a password in order to access the directory. Also, using the Master Reset option clears both the telephone and logon directories, then unlocks them.

4.17 COMMAND CONCATENATION

You may concatenate a command and its further inputs into a command string. The space (SP) character is used as a delimiter and the string is terminated with a CR. If an error occurs while the modem is processing the command string, the modem will display an error message and prompt for further commands or inputs.

The command code may be concatenated into a command string as the first item. You may then enter the command mode from the idle mode. Thus the command string would be executed without the intermediate menus and prompts.

You can use command concatenation for commands C, D, and R, to execute each command in a one line command string.

For example:

>R SP 2 CR	(Redial last dialed telephone number with two retries.)
>DSP (818)-768-2211CR	(Dial (818)-768-2211.)

>CSP1 P(818)-768-2211SPMICOMSP2SP3CR

Change or store telephone number at address 1 to a new telephone number: (818)-768-2211. Assign the following to this address:

- Mnemonic is MICOM
- Number of retries is 2
- Link this telephone number with address 3

For the C command, you don't have to have all entries specified in the command string. The modem will pick up from where you stop, or where you have the first error entry in the command string.

NOTE: For the other commands, you may find there is either limited or no command concatenation applications. Use of the command concatenation is not recommended in all cases.

4.18 MNEMONIC AUTO-DIAL

The mnemonic you defined at each phone number address may be used as a dialing command. When the modem receives a mnemonic dialing command, it will invoke the same function as it does to the associated numerical dialing command.

4.19 ABORT PHONE DIAL AND/OR LOGON

While the modem is dialing a telephone number or doing a logon, you may abort the dialing or logon by pressing any key except the S key before the line connection is made. If you do not have a logon setup, press any key to abort the dialing sequence.

4.20 THE Q (GO ON-HOOK) COMMAND

When you select the Q command, the modem will go into the offline command mode from the online command mode.

SECTION 5
TESTING YOUR MODEM

5.1 DIAGNOSTICS

Your MICOM modem should operate trouble-free with very little care. This section explains what to do if you encounter a problem with your modem or system.

Your modem has several built-in test features that you can use to determine if it is working properly. It will isolate a fault in your system to: a modem, the DTE, or the telephone line.

As explained in section 2, your modem goes through a self-test routine each time power is applied. If the **MR** indicator FLASHES, your modem is faulty and should be returned to MICOM Customer Service for repair (refer to the Customer Service page in the front of this manual for instructions).

WARNING: FCC regulations prohibit repair of FCC registered devices by anyone other than the manufacturer or their authorized representative. Any attempt on your part to repair the modem can void FCC registration and your MICOM warranty. Always return the modem to MICOM for repair.

When your modem is operating properly in the data mode, its **MR** and **OH** indicators should be ON steady and either the **LS** or **HS** indicator should be ON steady. If the **LS** or **HS** indicator is FLASHING or the **MR** indicator is OFF, the modem is probably either in a test mode or in voice mode. See the indicator status in table 2-5.

If there are indications of a problem with your system, you can use several of the built-in test modes to isolate the fault. The test modes may be initiated from the DTE using the TEST MENU or by activating switches on switch group S1. Section 4 explains how to activate the tests from the TEST MENU. This section explains how to select tests by using the switch group. The tests operate the same, whether you select them from the DTE keyboard or by activating the switches.

5.1.1 Local Analog Loopback

For local Analog Loopback (AL), set test switch S1-1 ON. This will place the modem in the AL test mode shown in figure 5-1. In this mode, the modem's transmitter and receiver are disconnected from the telephone line and the output of the transmitter is connected to the input of the receiver. The phone line is busied out to prevent incoming calls. This allows the modem to be checked from the connecting DTE or with an external test set.

Also in this test mode, the modem's transmitter is switched to operate at the same frequency as its receiver. In the originate mode (S1-6 OFF), the modem uses the high frequency channel; in the answer mode (S1-6 ON), it uses the low frequency channel. You should test the modem in both the originate and answer modes.

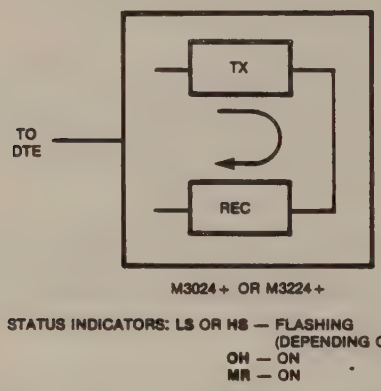
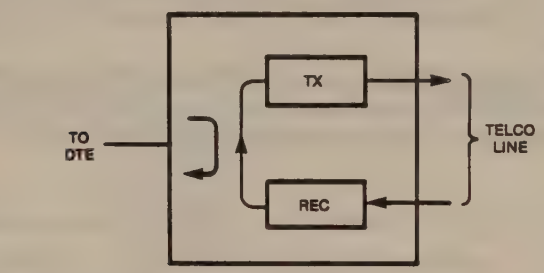


Figure 5-1. Local Analog Loopback Test Mode

5.1.2 Local Digital Loopback

For local Digital Loopback (DL), set test switch S1-4 ON. This will place your modem in the DL test mode shown in figure 5-2. The modem's transmitter and receiver will be disconnected from the DTE and the output of its receiver will be connected to the input of its transmitter. The DTE TX data will loop back to its own REC channel. This allows you to test your DTE or your modem to be tested from a remote site over the telephone line.



STATUS INDICATORS: LS OR HS — FLASHING (DEPENDING ON DATA RATE)
OH — ON
MR — ON (DEPENDING ON LINE CONNECTION)

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Figure 5-2. Local Digital Loopback Test Mode

5.1.3 Remote Digital Loopback

For Remote Digital Loopback (RDL), make a data connection with a remote modem (refer to paragraph 3.1). Then set test switch S1-3 ON.

Your modem will send signals to the remote modem, placing it in the DL test mode. The remote modem must be able to interpret these signals to conduct the RDL test. The end-to-end configuration of this mode is shown in figure 5-3. You can then test your modem, the telephone line, and the remote modem from your DTE or from an external test set connected to your modem. When you set test switch S1-3 OFF, both modems return to their normal operating condition.

When a remote modem places your modem in the digital loopback condition, the indicators on your modem will show **LS** or **HS** FLASHING (depending on which speed you selected), **MR** ON and **OH** ON.

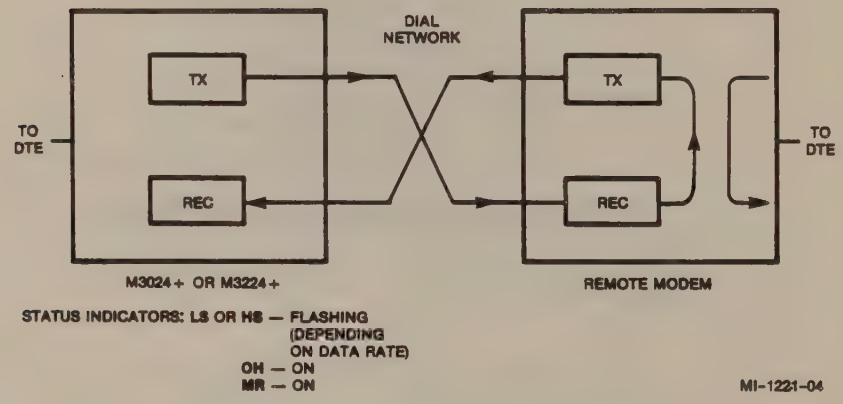


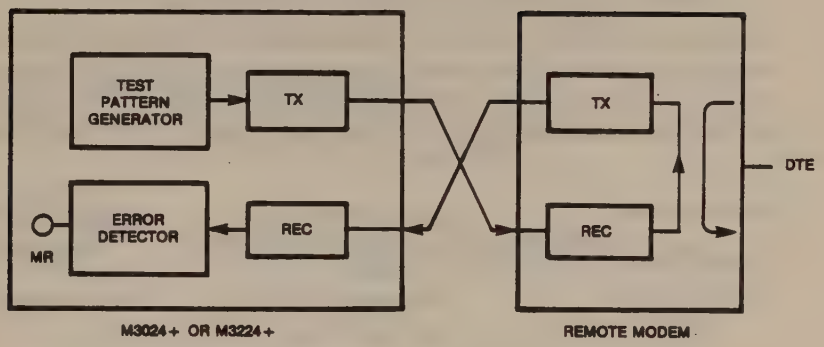
Figure 5-3. Remote Digital Loopback Test Mode

5.1.4 Test Pattern

To enable Test Pattern (TP), set test switch S1-2 ON. This will disconnect your modem from the DTE and enable a built-in test pattern generator and error detector. In this test mode, your modem transmits a scrambled one and zero pattern and expects to receive that pattern. Any received differences or errors will cause the **MR** indicator to FLASH for 250 ms.

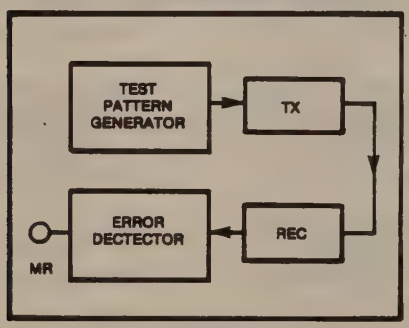
The test pattern can be selected with analog loopback (AL), or remote digital loopback (RDL) as shown in figure 5-4. Note that, as in local AL, activating the TP and AL switches forces the local modem off-hook and does not involve a remote modem.

TP AND RDL SWITCHES ACTIVATED:



STATUS INDICATORS: LS OR HS — FLASHING (DEPENDING ON DATA RATE)
OH — ON
MR — FLASHING * (IF ERRORS RECEIVED)
OFF (NO ERRORS)

TP AND AL SWITCHES ACTIVATED:



STATUS INDICATORS: LS OR HS — FLASHING (DEPENDING ON DATA RATE)
OH — ON
MR — FLASHING * (IF ERRORS RECEIVED)
OFF (NO ERRORS)

*TURNS ON FOR 250 MS EACH TIME ERRORS ARE DETECTED

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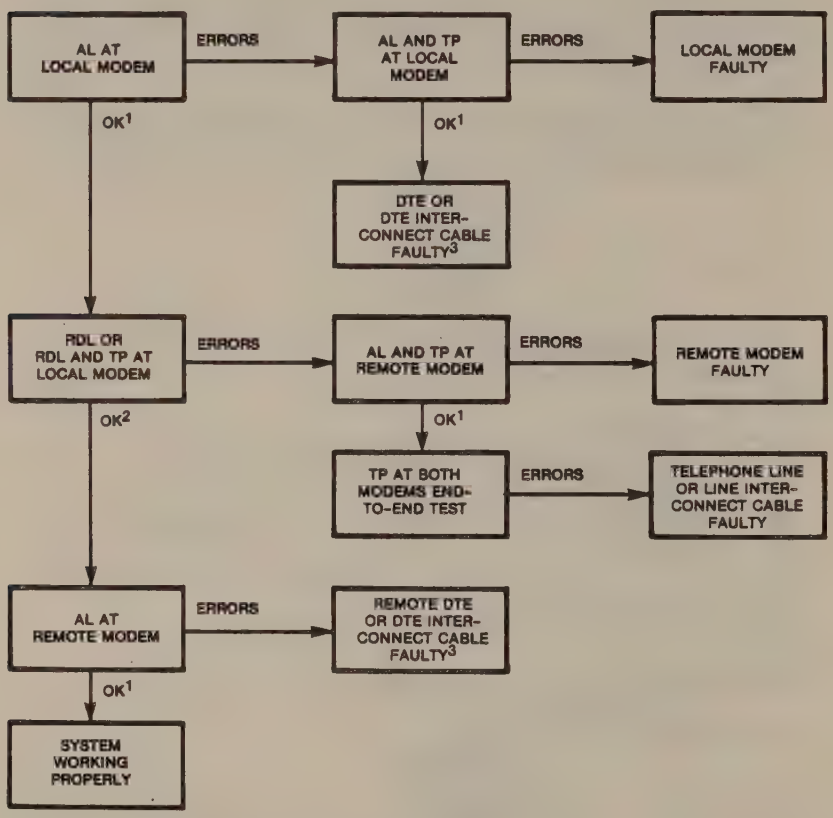
Figure 5-4. Test Pattern Test Mode

5.2 USING TEST MODES TO ISOLATE SYSTEM FAULTS

The chart in figure 5-5 shows a system troubleshooting sequence using the built-in test modes of your modem. Select the test modes by the appropriate test switch. Note that system troubleshooting requires a modem at the remote end with both compatible test features and the cooperation of the remote party.



NOTE:
1. NO ERRORS AT ALL.
2. ERRORS MAY OCCUR OCCASIONALLY (LESS THAN ONE EVERY 30 SECONDS) WHEN TESTING OVER THE TELEPHONE LINE.
3. DTE OPTIONS MAY BE SET INCORRECTLY

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Figure 5-5. System Troubleshooting

APPENDIX A
TECHNICAL SPECIFICATIONS

A.1 PHYSICAL SPECIFICATIONS

Indicators: Low Speed (**LS**), High Speed (**HS**), Modem Ready (**MR**), and Off-Hook (**OH**)

Operating Environment: 32 to 113 °F (0 to 45 °C),
0 to 95% relative humidity (non-condensing)

Power:

Standalone Unit
115 V ac ±10%, 45 to 65 Hz, 9 W

Card Module
9 W

Size:

Standalone Unit
8¾ inches (22.2 cm) wide
2¼ inches (5.7 cm) high
11½ inches (29.2 cm) deep
Weight: 3½ pounds (1.6 kg)

Card Module
¾ inch (1.9 cm) wide
7½ inches (19.1 cm) high
11½ inches (29.2 cm) deep (includes DM switch and connector)
Weight: 1¼ pounds (0.56 kg)

Storage Temperature: −40 to 176 °F (−40 to 80 °C)

A.2 LINE INTERFACE SPECIFICATIONS

Carrier Detection Thresholds:
DCD on: more than −43 dBm or −26 dBm
DCD off: less than −48 dBm or −31 dBm

Carrier Frequencies:

Originate Mode
Transmit: 1200 Hz ±0.01%
Receive: 2400 Hz ±7 Hz

Answer Mode
Transmit: 2400 Hz ±0.01%
Receive: 1200 Hz ±7 Hz

Line Connection Arrangements:	Permissive, Programmed, or Fixed Loss Loop
Line Connector:	RJ45S, RJ41S, or RJ11C
Line Type:	Direct Distance Dialing (DDD) or private leased line
Modulation / Demodulation:	DPSK (Differential Phase Shift Keying) per CCITT V.22 bis
Receiver Dynamic Range:	0 dBm to −43 dBm or −26 dBm
Transmit Level:	Programmed: 0 to −12 dBm Fixed Loss Loop: −4 dBm Permissive: −10 dBm ±1 dB

A.3 TERMINAL INTERFACE SPECIFICATIONS

Asynchronous Rate Ranges:	Normal — 1200 or 2400 bps ±1%; Extended — 1200 or 2400 bps +2.3%, −2.5% (switch selectable or programmable)
Character Length:	8 to 11 bits (switch selectable or programmable) including start and stop bits
Control Signals:	Refer to appendix B
CTS Response:	CTS turns on and off with RTS within 3.5 ms
Data Rates:	1200 and 2400 bps asynchronous or synchronous
Interface:	EIA RS-232-C (CCITT V.28)
Terminal Location Requirements:	Within 50 feet of modem (in accordance with EIA RS-232-C)

APPENDIX B
MODEM-TO-DTE CONNECTOR PIN ASSIGNMENTS

Pin	EIA Circuit	MICOM Equivalent	Source	Description
1	AA	FG	• • •	Protective Ground
2	BA	TD	DTE	Transmitted Data
3	BB	RD	Modem	Received Data
4	CA	RTS	DTE	Request-To-Send
5	CB	CTS	Modem	Clear-To-Send
6	CC	DSR	Modem	Data Set Ready
7	AB	SG	• • •	Signal Ground
8	CF	CD	Modem	Data Carrier Detect (Received Line Signal Detector)
9	• • •	• • •	Modem	+ Test Voltage
10	• • •	• • •	Modem	− Test Voltage
11	• • •	• • •	• • •	Not Connected
12	CI	SMI	Modem	Speed Mode Indication (ON = 2400; OFF = 1200)
13	• • •	• • •	• • •	Not Connected
14	• • •	• • •	• • •	Not Connected
15	DB	TC	Modem	Transmit Clock
16	• • •	• • •	• • •	Not Connected
17	DD	RC	Modem	Receive Clock
18*	CN	AL	DTE	Analog Loop Command
19	• • •	• • •	• • •	Not Connected
20	CD	DTR	DTE	Data Terminal Ready
21	• • •	• • •	• • •	Not Connected
22	CE	RI	Modem	Ring Indicator
23	CH	DRS	DTE	Data Rate Select (Originate Mode only)
24	• • •	• • •	• • •	Not Connected
25*	CN	AL	DTE	Analog Loop Command

* Pin 18 and pin 25 functions are interchangeable and selected by system operating switches on the modem. (See table 2-4.)

NOTE: The signals on pins 4, 18, 20, 23, and 25 of the EIA interface are internally biased to default settings.

- Pin 4 (RTS) is biased to ON.
- Pin 18 (AL) is biased to AL disable.
- Pin 20 (DTR) is biased to ON.
- Pin 23 (DRS) is biased to 2400 bps.
- Pin 25 (AL) is biased to AL disable.

APPENDIX C
COMMAND SUMMARY

COMMAND	DESCRIPTION
A	When selected, the A command forces the modem to go off-hook in answer mode. It is used in instances when voice coordination of a data transfer is made and you agree to be the answer modem. The A command is ignored by the modem in all other cases.
C	The C command is used to change, store, or delete a number stored in the directory or to clear the entire directory. When selected, the modem prompts for the ADDRESS?. If a number from 1 to 20 is entered, the modem goes through the "change or store number" sequence. If the ADDRESS? prompt is answered with a 0CR, the modem goes through the "clear memory" sequence.
CL	The CL command is used to change, store, or delete a logon sequence stored in the logon directory or to clear the entire logon directory. When selected, the modem prompts for the ADDRESS?. If a number from 1 to 20 is entered, the modem goes through the "change or store logon sequence." If the ADDRESS? prompt is answered with a 0CR, the modem goes through the "clear the logon directory" sequence.
D	The D command is the keyboard or immediate dial command. When used, the modem prompts NUMBER? and the number to be dialed is entered at the terminal keyboard with any special characters desired.
H(ELP)	The H or HELP command, when used at any time in response to the command prompt, causes the modem to immediately display the HELP list of commands.
I	The I command returns the modem to the idle mode.
M	The M command is used to display the contents of the number directory.
ML	The ML command is used to display the contents of the logon directory.

COMMAND SUMMARY (continued)

COMMAND	DESCRIPTION
O	When selected, the O command forces the modem off-hook in the originate mode. This command is used after voice coordination of a data call results in your modem being designated as the originate end.
P,?	The P or ? command causes the modem to print the Command menu.
Q	When selected, while in the on-line mode, the Q command disconnects the modem from the line. The modem remains in the command mode.
R	The R command causes the modem to redial the last number dialed.
T	The T command is used to display the contents of the Configuration menu.
TM	The TM command is used to display the contents of the Test menu.

APPENDIX D
SPECIAL CHARACTERS SUMMARY

SPECIAL CHARACTER	DESCRIPTION
B	The B character enables the blind dialing mode. It is always embedded in the appropriate position of a directory or keyboard dial number string. It is used primarily on PABX or independent telephone company lines where a non-standard dial tone cannot be detected by the modem. When the B character is detected, the modem waits 5 seconds, then dials the remaining numbers.
V	The V character is used to place the modem online in the voice mode. It must be entered as the last character in a stored or keyboard-dialed telephone number string.
;	When embedded as the last character of the telephone number string, the semicolon tells the modem to return to the command mode, but to remain online after the handshake with the remote modem has been successfully completed.
@	When this character is embedded as the first character of a telephone number string or logon sequence (when storing them), it causes the modem to send @ characters to the terminal instead of the number or logon sequence. It is used to provide security for the numbers and sequences stored in the directories.
$	When embedded in a telephone number of a directory or keyboard dial, the $ character causes the modem to pulse-dial all digits following until they are cancelled by the & character.
&	When embedded in a telephone number in directory dial or keyboard dial, the & character causes the modem to cancel pulse dialing and return to the tone dialing mode.
?	Acts as the P command to call up command menu to screen.

SPECIAL CHARACTERS SUMMARY (continued)

SPECIAL CHARACTER	DESCRIPTION
\	When embedded as the last character of a logon string before the CR, the \ character causes the modem to not send CR at the end of this logon string.
!	If it is the only character in a logon string, the ! character causes the modem to wait for a response, then proceed to the next auto-logon string.
'	When changing, storing, or displaying a logon sequence, the ' character should be followed by two characters, 8X (X equals 1 through F, hex). The number formed by this combination equals a time-delay function in auto-logon. The modem will delay for the specified time, then proceed to the next auto-logon string. Refer to appendix F for the time-delay function table.

APPENDIX E
MODEM RESPONSES SUMMARY

E.1 COMMAND MODE MESSAGE SET

>_

This is the command prompt used to prompt you for any valid command characters when the modem enters the command mode. It is also issued whenever a command has been successfully executed and the modem returns to the command mode (either in online or offline mode) rather than the data mode or idle mode.

ADDRESS?

This is used to prompt for the address of the directory number to be changed or stored after the C command is entered.

CLEAR ENTIRE DIRECTORY?(Y/N)

This is used to ensure that you want to clear the telephone directory after you entered the C command.

CLEAR LOGON?(Y/N)

This is used to ensure that you really want to delete the logon entry at a specific address.

CLEAR LOGON DIRECTORY?(Y/N)

This is used to ensure that you want to clear the entire logon directory after you entered the CL command.

CLEAR MEMORY? (Y/N)

This is used to ensure that you really want to clear the number directory after you entered the C command.

CLEAR NUMBER? (Y/N)

This is used to ensure that you really want to delete the number entry at a specific address in response to the C command entered in the change number mode.

DEFAULT SETTING?(Y/N)

This is used to ensure that you really want to do a master reset of the Configuration Menu and to select the default values for all settings after you have entered the 0 command in the Configuration Menu.

DIRECTORY CLEARED!

This is issued when the telephone directory is cleared.

E.1 COMMAND MODE MESSAGE SET (continued)

DIRECTORY LOCKED!

This is used when you attempt to display or change a locked number directory or logon directory.

I AM NOT PROGRAMMED TO RECOGNIZE THE COMMAND XX AT THIS LEVEL!

This is used whenever you execute an invalid command at any level. The characters XX will be the invalid command. It is entered so that you can see what caused the error message.

IDLE

This is used each time the modem goes from the command mode to the idle mode.

LINK NUMBERS?

This is used to prompt for the telephone number linking commands in response to the C command and to link logon sequences to telephone numbers in response to the CL command.

MEMORY CLEARED!

This confirms that the number directory memory has been cleared after a YCR response to the CLEAR MEMORY? (Y/N) prompt.

MEMORY FULL!

This is used when all addresses in the number have been used, or when stored long numbers have filled the memory and prevent you from using all addresses. The modem returns to the command mode after issuing the message.

MNEMONIC?

This is used to prompt for mnemonic name in a telephone number entry after you entered a C command.

NO

This appears in the REDIALS and LINKED# fields of the number directory. It indicates that no redials and/or linked numbers have been selected for the number at that address.

NUMBER?

This is used to prompt you for the number to be dialed when you enter the D command.

NUMBER CLEARED!

This confirms that the number entry, at a specific address, has been deleted after a YCR response to the CLEAR NUMBER? (Y/N) prompt.

NUMBER OF RETRIES?

This is used to prompt you for the number of times you want the modem to redial a number that is called up by the R and C commands.

NUMBER OF TIMES SENT?

This is used to prompt you for the number of times you want to have the FOX MESSAGE transmitted when you enter the 2 command in the TEST MENU.

OLD LOGON:
!
'80113
!
'83LOGIN
•
•
•
NEW LOGON? (OR ENTER CMD CHAR TO EXIT)

This is used to prompt you to change, store, or delete a logon sequence when you issue the CL command.

OLD NUMBER: XXXXXXX ...
NEW NUMBER?

This is used to prompt you for the new number to be stored in the directory when you use the C command in the change or store number mode. The XXXXXXX field will be blank if the directory address is empty.

E.1 COMMAND MODE MESSAGE SET (continued)

TEST PERIOD IN SECONDS:

This is used to prompt you for the duration of a test mode selected from the TEST MENU.

TYPE HELP FOR HELP LIST OF COMMANDS, OR ANY VALID COMMAND!

This is used each time that the modem enters the command mode from the idle mode: on initial power up or on power up after the parity and/or the data rate have been changed. It informs you that the modem is ready to execute commands received from your terminal. The message is suppressed if the modem powers up and the parity and data rate are the same as at the last power up.

E.2 CALL PROGRESS MESSAGE SET

DIALING XXXXX . . .

This is used after the CR which tells the modem to execute a D command or a directory dial command. The message is issued only once for each dial command executed. The short form of the message is the digit 6.

FAILED CALL!

This is used when the modem is unable to detect any valid call progress tones and the failed call abort timer times out. The short form of the message is the digit 3.

LINKING

This is used when the modem has been unable to complete a call to the first number dialed, and the number has been linked to another in the directory. The short form of the message is the digit 8.

OFFLINE

This is used when the modem goes on-hook. The short form of the message is the digit 9.

ONLINE! 2400

This is used when successful handshaking has occurred with the remote modem. This tells you that the modem is connected to another modem at 2400 bps. The short form of the message is the digit 5.

ONLINE! 1200

This is used when successful handshaking has occurred with the remote modem. This tells you that the modem is connected to another modem at 1200 bps. The short form of the message is the digit 1.

E.2 CALL PROGRESS MESSAGE SET (continued)

VOICE!

This is used when the remote telephone goes off-hook and broadband energy (voice) is detected on the line. The short form of the message is the digit 4.

APPENDIX F
LOGON TIME DELAYS

Table F-1. Logon Time-Delay Functions

Timing Code (Hexadecimal)	Time Delay*
'80	50 ms.
'81	100 ms.
'82	250 ms.
'83	500 ms.
'84	1 s.
'85	2 s.
'86	3 s.
'87	6 s.
'88	9 s.
'89	12 s.
'8A	15 s.
'8B	18 s.
'8C	21 s.
'8D	24 s.
'8E	27 s.
'8F	30 s.

*During a time delay in an auto-logon sequence, you may enter S to cancel the time delay and proceed to the next auto-logon string.

PUBLICATION CHANGE REQUEST

A message to our readers: we try to make our product manuals as accurate, complete, and easy to use as possible. If you have an improvement to suggest (or find an error in this manual), **LET US KNOW:**

a. Fill in the four sections below.
b. Staple any marked-up pages to this side of request form.
c. Fold entire package in thirds—so that the MICOM address shows.
d. Staple package shut.
e. Fill in your return address in the space provided on both sides of this request form.
f. Drop in mail box.

MANUAL IDENTIFICATION (take from the title page of your manual)

EQUIPMENT COVERED (take model number from silver tag on unit) _____

DATE OF MANUAL _____ STOCK NUMBER _____

PROBLEM *

_____

_____

_____

_____

_____

SUGGESTED SOLUTION *

_____

_____

_____

_____

_____

READER IDENTIFICATION

NAME AND TITLE _____ DATE _____

ADDRESS _____ TELEPHONE ( ) _____

_____

---

* The best way to help us identify and correct the problem you discovered is to attach marked-up copies of the affected pages.

Thank you for taking the time and making the effort to fill in this request. We will review and respond to your request by return mail.

MICOM Technical Publications

MICOM Form No 1077b

Fold Here

From: _____

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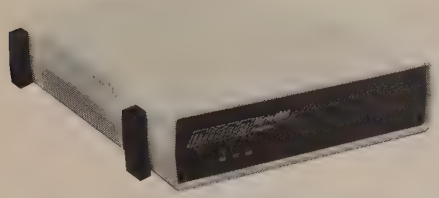
INTERESTED IN OTHER MICOM DATA COMMUNICATIONS PRODUCTS?

Modems

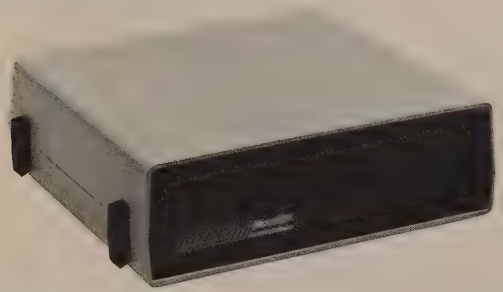
4000 • HIGH-SPEED COMMUNICATIONS

The Micro4000 Data Modem family is a series of inexpensive data modems operating at speeds from 2400 to 9600 bps. The modems conform fully to CCITT specifications and *all* models are suitable for both multipoint and point-to-point applications. Both 4800 and 9600 bps models feature a *speedshift* fast poll operation. A unique *asynchronous* 2400 bps modem is offered for use with teletype-compatible, "dumb" CRT and printing terminals. Very low-cost No-Frills™ models are also available.



8000 • MULTI-TERMINAL COMMUNICATIONS

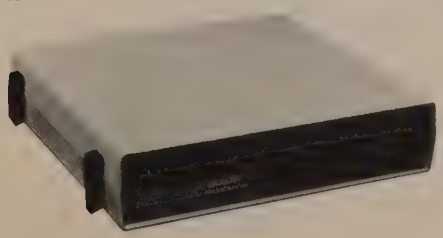
The Micro8000 Concentrator Modem is the world's first high-speed modem series with built-in data concentrator and automatic retransmission-on-error. The model range supports from 2 to 16 asynchronous or synchronous terminals and operates at speeds of 2400, 4800, and 9600 bps point-to-point, or 2400 and 4800 bps multipoint, over any standard telephone line. Concentrator PAD models are also offered for access to Packet Data Networks.



Message Concentration

280 • TERMINAL SHARING

The Micro280 Message Concentrator is a buffered terminal-sharing or port-sharing controller which permits up to eight devices or ports to output messages to a single teletypewriter-compatible terminal or, conversely, permits one terminal to output messages to as many as eight devices or ports.



Multiplexing

100 • LINE MULTIPLEXING

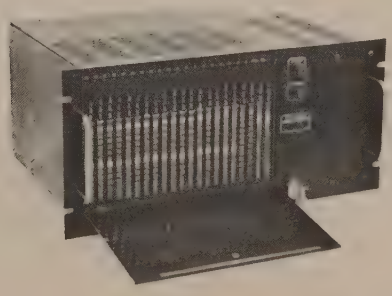
The Micro100 Line Multiplexor permits data transmission at speeds of 19,200 bps and above over voice-grade telephone lines. The Micro100 combines the data transmission capacity of two, three, four, five, or six lines, each equipped with 9600, 14,400 or 16,000 bps modems, to provide transmission rates up to 64,000 bps. The Micro100 offers an economical alternative to expensive wideband communication circuits.

700 • SYNCHRONOUS MULTIPLEXING

The Micro700 Band Splitter is a very low-cost, synchronous multiplexor designed to split a trunk data rate of up to 38,400 bps into up to four synchronous subchannels. Subchannel rates may be ¼, ½, or ¾ of the trunk data rate. A single thumbwheel switch is used to select one of eight channel rate combinations.

750 • WIDEBAND MULTIPLEXING

The Micro750 Wideband Multiplexor is a time-division multiplexor (TDM) designed to derive multiple synchronous channels from a single wideband circuit operating at 40.8, 48, 50, 72, or 256 kbps—or a DDS circuit operating 56 kbps. The Micro750 can also be used to provide speed conversion between 50 and 56 kbps—or any other two wideband rates. EIA RS-232-C (CCITT V.24/V.28), CCITT V.35, Bell 303, CCITT V.11, and EIA RS-449 high-speed composite interfaces are supported.



Network & Switching

600 • DATA SWITCHING

The Series 2 Micro600 Port Selector provides *contention,* permitting a large number of asynchronous terminals to compete for access to a smaller number of computer ports, and *port selection,* allowing the terminal operator to select from his keyboard a particular "class" of computer port. Up to 1504 terminals and/or computer ports can be attached to a single Micro600. The Micro650 provides similar capability for *synchronous* terminals for up to 127 synchronous lines/ports.

400 • SHORT-HAUL COMMUNICATIONS

The Micro400 Local Dataset family provides low-cost, full-duplex asynchronous or synchronous data transmission over distances up to 20 miles, point-to-point or multipoint. A special *smart* asynchronous model provides dial-up emulation for use with timesharing systems. All asynchronous models can be connected directly to a Micro600 Port Selector quad module, providing a very low-cost solution for local data distribution applications. (For example, the 400/600 model is specifically designed for inexpensive terminal-controlled applications with the Micro600.) Local Dataset models are Bell 43401-compatible and operate over telephone company unloaded metallic circuits.

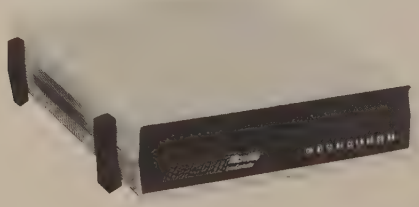
470 • SHORT-HAUL MULTIPLEXING

The Instamux470™ is an extremely low cost *multiplexing line driver* which allows up to eight asynchronous terminals to communicate over two twisted pairs of wires at distances of up to 5000 feet. The Instamux470™ is transparent to terminal code and speeds to 19,200 bps. MICOM also offers integral module versions of the Instamux470™ for installation in Micro600 Port Selector.

Error Control

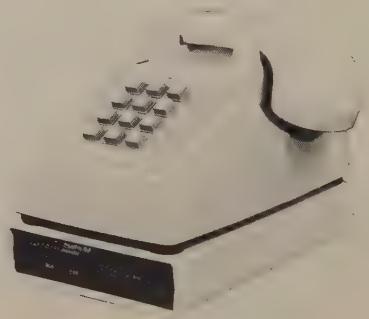
500 • ERROR-FREE COMMUNICATIONS

The Micro500 Error Controller eliminates transmission errors for teletype-compatible CRT and printing terminals and interactive graphics terminals communicating over telephone lines at speeds to 9600 bps. It also provides *asynchronous-to-synchronous* conversion allowing asynchronous terminals to operate with synchronous modems, and permits *full-duplex* asynchronous interactive terminals to operate with *half-duplex* synchronous modems at 2400 or 4800 bps on the dial network. MICOM offers an error controller with built-in modems (at 2400, 4800, or 9600 bps) called the Micro5000 Intelligent Modem.



460 • DATA/VOICE MULTIPLEXING

The Instalink460™ Data/Voice Multiplexor allows simultaneous voice and data transmission utilizing *existing* in-plant telephone wiring. The Instalink460™ system consists of data/voice multiplexors at the users' telephones and a central chassis at the telephone PABX equipment room which connects to the user's computer or data PABX. Instalink460™ units operate at speeds up to 19,200 bps over distances up to 5000 feet and are *FCC Part 68 registered.*



Data Concentration

800/2 • STATISTICAL MULTIPLEXING

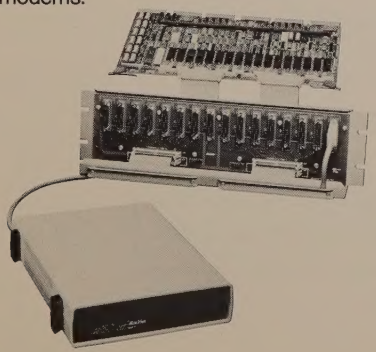
The Micro800/2 Data Concentrator is a low-cost second generation statistical multiplexor which allows up to sixteen terminals, both synchronous and asynchronous, to share a single telephone line. Retransmission-on-error between concentrators is automatic. Special low cost models are offered for users of Hewlett-Packard HP 3000 computer systems. The Micro200 Port Concentrator, Model 220, allows Micro800/2 users to achieve additional system economies by reducing the number of computer ports required to support remote terminal clusters.

900 • MULTIDROP STATISTICAL MULTIPLEXING

The Micro900 Multidrop Concentrator permits up to 16 asynchronous, "dumb" terminals to share a single telephone line, multidropped in up to 16 separate locations. It allows multidropping of " dumb" terminals without polling software and provides automatic retransmission-on-error to ensure *error-free* communications.

1011 • UNIBUS® MULTIPLEXING

The Series 11 BusDriver™ is *both* a DEC UNIBUS® replacement (for DH11 or DZ11 multiplexors) for local channel access *and* a port concentrator for remote data concentration. The BusDriver™ provides access into a PDP-11 or VAX computer for up to 32 asynchronous terminals via a single HEX-size UNIBUS® module and is *fully* DEC-diagnostic compatible. A 16-connector panel provides access for local terminals and concentrated data streams. Options include expansion Remote Concentrator Controllers and integral 2400, 4800, or 9600 bps modems.



800/X.25 • PACKET ASSEMBLY/DISASSEMBLY

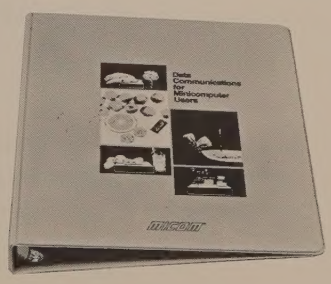
The Micro800/X.25 Concentrator PAD is an *extremely low-cost* Packet Assembler/Disassembler (PAD) Concentrator which provides asynchronous terminal concentration for Packet Data Networks by combining field-proven Micro800/2 features with CCITT Recommendations X.25, X.3, X.28, and X.29. Each unit has a command port for local terminal control, plus optional Network Control Facility Software is offered for *centralized* management of a Micro800/X.25 PAD network.

860 • CONCENTRATOR SWITCHING

The Micro860 Concentrator Switch is a low-cost *data concentrator switch* which interconnects up to eight Micro800/2 Data Concentators. The Micro860 operates as the hub of a network to allow any asynchronous channel on any of the data concentrators to connect with *any* channel on that or any other data concentrator. Standard Micro860 features include port switching, port contention, network command and log ports, and local switching.

Micom Seminar on Data Communications

If you would like to learn more about the subject of data communications, MICOM organizes tutorial Seminars designed specially for the minicomputer user. The Seminars are offered nationwide throughout the year. Please call us to request a Seminar program and schedule. Act *now* to reserve your seat—space is limited.



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